LIBRARY OF CONGRESS
JUN 21 1880
SMITHSONIAN DEPOSIT.

THE AMERICAN GAS LIGHT JOURNAL

REDMANKENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XXXII.—No. 12. Whole No. 504. | NEW YORK, WEDNESDAY, JUNE 16, 1880. | $3 PER ANNUM IN ADVANCE.

A. M. CALLENDER & CO., Proprietors.
G. WARREN DRESSER, C.E., Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European Countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The American News Company, Nos. 39 and 41 Chambers Street, New York, are agents for this Journal. Newsdealers will send orders to them.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Correspondence.—Wishing to make this Journal a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of these subjects a pleasure or a profession.

Books.—We will mail, post-paid, at publishers' lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. No books will be sent C. O. D.

CONTENTS.

☞ An asterisk (*) denotes an illustrated article

British Association of Gas Managers..... 265

EDITORIALS—
The Western Gas Association..... 265
An Accidental Extinction of Gas Lights..... 266
Obituary—Mr. W. F. Fewtrell..... 266
Hastings's English Gas and Water Directory..... 266
Large Gasholders..... 266
Proceedings of the Third Annual Meeting of the Western Gas Association..... 267
Proceedings of the First Annual Meeting of the Central New York Gas Engineers Association..... 271
Baltimore Gas Consolidation..... 275
Casting Gas Pipes Vertically..... 275

CORRESPONDENCE—
Gas Making in the West..... 276
Suffocation by Water Gas..... 276
A Terrible Calamity..... 276
Death of John C. Westwood..... 277
Suffocated by Illuminating Gas..... 277
A New Safety Lamp..... 277
Remunerative Gas Stock..... 277

British Association of Gas Managers.

The seventeenth annual meeting of the members of the British Association of Gas Managers was held on the 8th, 9th, and 10th inst., at the Institution of Civil Engineers, Great George Street, Westminster, and there is every indication that a very successful meeting was had. The Presedential chair was filled by Charles Hunt, Esq., C.E., of Birmingham, and the programme of papers read was very interesting. Mr. Travers, of Cork, dealt with the subject of the Thermal Heating Power of Gas Cooking and Heating Apparatus. Mr. Stevenson discoursed on Regenerative Furnaces for Heating Retorts. Mr. F. Livesey, on the subject of Retort Furnaces generally. Besides these a large number of other valuable papers were read, the enumeration of which our present limited space forbids. The proceedings in detail will be found in our succeeding numbers.

THE WESTERN GAS ASSOCIATION.

The Third Annual Meeting of this Association was held at Indianapolis, Indiana, during last month, the sessions lasting for three days. We have just received the full proceedings, which we begin to publish in another column. If any argument was necessary to convince any one interested in the manufacture of gas of the value of these meetings, it would certainly be found in the report of the proceedings referred to. The meeting appears to have been plain, practical, straightforward, and businesslike, during which much useful information was imparted. The facts brought out upon the practical use of the gas engine are of themselves of sufficient value to warrant the expenditure of the time and money involved in the meeting, and should stimulate every gas manager to push the development of his industry in this direction wherever the opportunity offers.

As another means of obtaining a day consumption, and consequently cheapening the cost of gas manufacture the discussion on gas stoves should encourage those timid souls who are holding back "for fear they will not work." That which one man has done another man may do; and we would simply ask our nervous, hesitating friends to consider what would be the effect upon their business if it were to happen during the next year, or the next three years, that 500 out of every 590 of their customers were to use gas stoves for cooking. Yet, Mr. Starr, of Richmond, Indiana, says that this is the proportion *now* among his consumers; and we would ask why is the city of Richmond, Indiana, so different from any other that it should be the only place where such a state of things exists?

We imagine that the difference is not in the town, or its inhabitants, but in the way the gas business is managed in that locality. We doubt not that many of the members of the Western Gas Association went home with the idea that they would try to bring their own companies into similar relations with their consumers. If the object of a gas company is to do all the legitimate business that it can get, to supply all the gas possible, that object cannot be attained by supinely waiting for customers to come along. There is no mystery about selling gas. All that is necessary is to make a good article, offer it at a fair price, and then work, at least a little, to sell it, and take some pains to show every consumer the very best and most economical methods of using it for every possible purpose for which it can be used.

The address of the President, Mr. J. O. King, was in all respects good—practical, plain, and short; and yet the points touched upon were the salient ones to be considered at this time, and especially so as regards the matter of residuals.

It is the waste now indulged in that should be stopped, and not until every one of the residual products are saved can it be said that there is no waste. It is true that the saving may be small, but everything counts either on one side or the other, and that which is not saved is lost and wasted. The days of high prices are rapidly going away. The advent of improved furnaces, mechanical appliances for saving labor, improved methods of saving residuals, and the application of gas to many hitherto unused purposes, render it possible, in the near future, to reduce the first cost of gas manufacture; and those who do not avail themselves of these improvements, and keep themselves posted and up with the times, will certainly be left behind in the race.

We congratulate the Western Gas Association upon the success of their efforts in promoting the advancement of the gas interests entrusted to their care.

[Communicated Article.]

An Accidental Extinction of Gas Lights.

Between 11½ and 11¾ o'clock, on the night of April 16th, many of the lights in the district supplied by the Newark Gas Light Company were extinguished. This was the case not only with the street lights but also with the lights in the public and private buildings.

The lights in the city of Orange, supplied from another and distinct works, were extinguished. The lights in East Newark, supplied by a separate works, were not affected. The lights in the cities of Brooklyn, New York and Jersey City were more or less affected, and the disturbance of pressure was indicated there on the registering pressure gauges.

This extinguishment of the lights in this city, at that time of night, caused not only much excitement and inconvenience, but was also attended with no inconsiderable risk. Happily, no accidents occurred.

One of the remarkable incidents of the phenomenon was the extinguishment of the lights in the lamps and buildings on one side of a street, while the lights on the other side, supplied by the same main pipe, continued to burn. In some cases the lights in one portion of a building, generally the upper portion, were extinguished, while those below were not. The lights in the upper portion of our district were more affected than in the lower. The variations in the pressure of the atmosphere, as indicated by our registering pressure gauges, show that at the works the pressure was unaffected, showing no trace of a disturbance, whereas. 3600 feet away, in a straight line, there was a sudden depression of an inch water pressure, and at 5,400 feet another gauge showed a depression of 4½ tenths, and then a rise of 5½ tenths, and then a fall of a tenth of an inch water pressure. In the city of New York there was an indicated variation of, in one case, as much as 16½ tenths.

The variation of pressure in the district supplied by us must in some cases have been as great as the pressure given by a column of water two inches in height.

The weather at 4 in the afternoon preceding the accident, was as follows: Barometer, 30.060, thermometer, 58°F., cloudy and no wind. At 11 at night it was dark and overcast, warm and close, and the barometer, taking the mean, was 29.910—there was little or no wind. At a little past 11,30, there came, preceded by an ominous murmur, an exceedingly severe gust of wind from the North-west, accompanied by heavy rain; this lasted not to exceed five minutes, after which it became calm and there was a decided fall in the thermometer. At the same time with the storm, it is stated, an immense flock of wild birds passed close over the housetops. It is estimated that there were many thousands of them, and it is reported that the noise they made could be heard for nearly an hour in all parts of our city.

At 7:30 in the morning the sky was clear, the barometer stood at 29.760, and the thermometer was 43°, showing a fall of fifteen degrees from the preceding afternoon.

The flow of gas was prevented, as nearly as can be estimated, about thirty seconds.

It appears that the extinguishment of the lights was occasioned by an unequal distribution of the atmospheric pressure, occurring in the path, or on either side of, a brief but unusually severe gale or gust of wind. Gas issues at any particular burner or portion of a district because its pressure is greater than that of the atmosphere; this excess of pressure, generally indicated by a water gauge, depending—

1st. Upon the initial pressure at the outlet of the governor; and

2d. Provided the pressure is not affected by the consumption, upon the comparative elevation or depression of the point of issue.

For instance, the pressure at the inlet of a governor being one inch water pressure, there is a point a certain distance below where the gas would no longer issue from an orifice. It is generally assumed that there is an increase or diminution of the gas pressure of one-tenth of an inch for every 10 feet of elevation or depression of the main pipes. This is not absolutely true, as the variation depends largely upon the specific gravity of the gas.

Taking, for instance, an elevation of 100 feet above the governor, it might be supposed that, inasmuch as the elasticity of the atmosphere at this point is diminished about one-tenth of an inch of mercury, as indicated by the barometer, so would the elasticity of the gas be diminished. The elasticity of the gas is diminished, but not in the same ratio as that of the air. The specific gravity of the gas being 420, the difference in elasticity would be equal to a weight of 30,896 grains per square foot, and one inch water pressure being 36,372 grains per square foot, the difference in gas pressure, as indicated by a water gauge, would be 30,896÷36,372=.849 of an inch, or, say 8½ tenths of an inch water pressure.

It would follow, therefore, that with an inch pressure at the outlet of the governor, the gas would not issue at a depression of 100÷100×.85=117.6 feet.

In other words, if the atmospheric pressure could be so distributed that, upon the same level as the governor from which the gas issues under one inch water pressure, it was greater in one location than the other, say, at the governor, it was equivalent to a column of mercury 29.910 inches in height, and 1000 feet away it was equivalent to a column of mercury 30.020 inches in height, it is quite evident that in the latter location the gas could not issue. Such a difference in the atmospheric pressure being about equivalent to lowering the level of the governor district 117.6 feet.

These conditions of unequal atmospheric pressure were produced in portions of our district, as indicated by the registering pressure gauges and extinguishment of lights. These sudden and unequal disturbances of atmospheric pressure are of rare occurrence, and, as far as I know, there is no record of such an extinguishment of gas lights. The possibility of such an accident occurred to me when passing through a cyclone at sea, in Oct. 1878. The barometer having fallen from 29.40, A.M., to 28.20 at 12, midnight, between the hours of 11 and 12 at night, before getting into the centre of the storm, the region of calm and lowest barometer, the rise and fall of the barometer was perceptible to the eye, and sometimes was as great as two-tenths of an inch of mercury inside of a minute. This variation in pressure being equal to a column of water 2.72 inches high, it is quite evident, if the ship had been stationary, and supplied with gas under an inch water pressure from a station unaffected simultaneously by these variations of the atmospheric pressure, that, at one moment the gas in the ship would have burned under more than double head, and the next moment would have ceased to issue. The conditions in respect to the elevation and depression of the district being that in one minute the elevation and depression were equal to a height of 272 feet. Since writing the above I see, by a letter of E. G. Love, Ph.D., in the *Sanitary Engineer*, of May 15th, that the disturbance of atmospheric pressure in New York differed in some cases from the conditions here. There the pressure was in some cases increased, in others diminished, being equivalent, in the former cases to an elevation of the district. Dr. Love writes—

"The recording barometer at the Central Park Observatory shows that just before 12 o'clock, on the night of April 16th, the pressure *rose* very suddenly from 29.59 inches to 29.71 inches. This sudden change of atmospheric pressure is sufficient, we think, to explain the phenomenon."

Obituary.

DEATH OF MR. W. T. FEWTRELL, F.C.S., AND DR. DAVID T. ANSTEAD, OF THE LONDON "JOURNAL OF GAS LIGHTING."

It is with sincere regret that we have received the announcement of the death of Mr. Fewtrell, one of the Editors of the London *Journal of Gas Lighting*.

His long experience in gas matters, his abilities as a chemist, and the long experience he had had as a gas chemist in London, rendered him exceptionally well-fitted for the labors which he has so well performed in connection with the first gas journal of the world, viz., the *Journal of Gas Lighting*. His loss will be severely felt not only at the post rendered vacant by his decease, but by all who had learned to rely upon him for the guidance of the gas fraternity in the sound principles of gas making.

Our friends of the London "Journal" are at this time doubly afflicted, for notwithstanding the loss of the proprietor, Mr. King, only about a year and a-half ago, and the loss of Mr. Fewtrell only a month since, they are also called upon, in their issue of May 25th, to record the death of another valued writer for their paper, in the department of "Water Supply," Dr. Anstead.

Such rapid changes serve to remind us of how small consequence we really are, and that as one falls another must step in and fill the gap in the ranks.

Hastings's English Gas and Water Directory.

We are in receipt of the Fourth Volume of this most convenient and useful work, giving, besides the names of each company, and the manager and chairman thereof, together with the address and population of the district, some useful statistics as to the coal carbonized and other working results of many of the companies in England.

The usefulness of this work cannot be questioned, and we trust that the enterprise may prove remunerative to the publishers. The statistics gathered from year to year are extending in amount; and it is a great pity that the condition of the business in this country does not warrant a similar undertaking here; but there is yet so much mystery enveloping what might be a perfectly open book that any attempt at such a work would meet with but little success.

LARGE GASHOLDERS.—Gasholders and tanks show a remarkable tendency to grow with the times. Mr. Corbet Woodall's Kennington Lane monster is no sooner an accomplished fact, than Mr. G. Livesey's interesting bantling engages attention. The Corporation of Birmingham, acting under the advice of Mr. C. Hunt, are about to construct two tanks at their Windsor street works, each of which will be 240 ft. in diameter and 51 ft. deep.

[Official Report.]

Proceedings of the Third Annual Meeting of the Western Gas Association.

Held at Indianapolis, Ind., May, 12, 13, and 14, 1880.

Indianapolis, Ind., May 12, 1880.

The Third Annual Meeting of the Western Gas Association was held this day at New Denison House, Indianapolis, Ind—J. O. King, Esq., President, in the chair, Lee A. Hall, Secretary.

Reading of minutes of last meeting dispensed with.

The President then read his annual address, which was upon motion referred to committee consisting of Messrs. Dunbar, Butterworth, and Littleton, to report at 2 P.M.

President's Address.

Gentlemen :—I am happy to see so many of the members of our Association present at this meeting to-day. Although it is yet in its infancy, I think we may congratulate ourselves on the interest manifested, and consider the Western Gas Association an established institution.

The value of such organizations is, I suppose, unquestioned. That they are almost universally established and sustained wherever illuminating gas is distributed is satisfactory evidence on this point. The value of these meetings to us will depend upon ourselves.

Among the benefits, and by no means the least, is the opportunity they afford of forming personal acquaintance with those engaged in the same pursuits. We can all affirm, whether our experience has been long or short, that it is beset with no ordinary difficulties. We are manufacturing and sending out an invisible substance, lighter than air, for general and common use, through long lines of conductors entirely hidden, subject at all times to obstructions and leakage, the former involving annoyance and vexation, the latter loss and danger.

And added to this are difficulties almost innumerable pertaining to its manufacture and storage. Notwithstanding the great progress that has been made in this direction, there are many things obscure, and much is yet to be learned. True, we have valuable publications devoted to our calling, in which all subjects of importance to us are ably discussed, and important improvements noted and described. Yet this does not compensate for the privilege of meeting face to face, and making known to each other what difficulties we have had and how they have been avoided or overcome. Also we may learn what economy has been secured by any change made in the usual process. Again, we may learn how to avail ourselves of the demand which the new uses to which our product is being applied with so much success—viz., mechanical power, cooking, and heating. The great convenience and absolute economy in cooking, and, I may add, mechanical power, particularly when remitting power is required, has been fully and satisfactorily demonstrated.

Our object and endeavor as gas men is to inquire for and adopt the best means to bring it before the public, and secure a more general demand for these purposes—perhaps I may add, to manage the public as well as the gas works in this direction.

I am supplying two of our large State charitable institutions with all the gas they need for heating irons and manglers for laundry purposes. It use is admitted by the officers of the institutions to be vastly more convenient and less expensive than the former practice of heating with coal, while the heat and other inconveniences are wholly avoided.

The demand for the gas engines is so great that the manufactures are quite unable to meet it with any promptness. The orders are months ahead of their ability to make the machines. I ordered one in January, which they would not promise to ship under ten weeks, and three months elapsed before it was shipped. I am informed that in March they would not engage to fill an order in less time than four months. This certainly promises well for the probable demand for gas, as far as this purpose is concerned.

While we desire that these engines should be introduced as rapidly as possible, we become impatient at such delay, particularly when other orders are pending, awaiting an examination of the engine and its working.

I think we have good reason to conclude that the electric light scare has spent its force. The great activity, both in this country and in Europe, among manufacturers of gas apparatus, and the large improvements made by gas companies in extending their works, is good evidence that they have full confidence in the permanency and increase of their business.

One of the great difficulties in small works is that the original cost represented in stock and bonds is exorbitant. Builders and contractors have heretofore reaped a rich harvest, and left the superintendet or manager to foot the bills—that is, to pay satisfactory dividends on the capital stock, or interest on bonds largely in excess of reasonable value. This, for some of us, has been a hard road to travel. I think now the matter is better understood. I hope the day for considering gas stock as fancy stock has passed. As gas has become a great public convenience, and, I may add, necessity, it should be furnished at as low a cost to the consumer as is consistent with paying a reasonable dividend to the capitalist, on a fair valuation of the plant and franchise.

I suppose most of you, like myself, have charge of comparatively smal works, where expensive experiments cannot be made, and where close economy is a necessity. I hope such will be free to ask questions and give their experience. In fact, I should like to have it a sort of experience meeting. I know that prepared papers are of great value to all of us, and deserve the thanks of the Association for the labor bestowed in preparing them. They are always duly appreciated, and I hope there will be no lack of them ; but let everyone cast into the common treasury whatever he has, being sure it will be valuable to some of us, if no more than the widow's mite.

After twenty-five years' experience, I am convinced that, with rare exceptions, real improvements are of slow growth. We are not unfrequently startled by the announcement that some new method has been discovered that is sure to revolutionize the whole business. Thus far I think we are indebted to the more perfected apparatus and better understanding of its management. That some valuable improvements have been, and that others will be made, is doubtless true ; and it is well for us in our meetings to discuss their merits. In fact, we should prove all things, and hold fast to that which is good.

Pardon me for introducing what seems to me not inappropriate on this occasion. I refer to the disposition of our State Legislatures to manufacture the gas for the use of public buildings and charitable institutions.

That gas, like everything else used, should be furnished at the least cost to the public, is admitted. But before they enter into competition in our or any other business, we have a right, as large taxpayers, to demand that all the factors that enter into the case should be taken into the account. The subject was agitated during the last session of our Legislature, and but for the very efficient action of Hon. Thos. Butterworth, a member of this body, would, I think, have prevailed.

Being called upon to confer with the trustees of one of our State charitable institutions located in our city, I was confronted with the claim that gas could be furnished, if done by themselves, at less than fifty cents per thousand feet. In reply, I asked the Superintendent to state the amount that the plant would cost. He named a very low cost, which I accepted as a basis. I calculated the interest at the legal rate. We agreed upon the wages that should be paid for a hand to take charge, the wear and tear of works, taxes, etc. The aggregate amount was more than the entire amount paid the gas company for their whole consumption, to say nothing of the materials that enter into its manufacture. I told them that if these items went into their general labor and expense account it would make a very different, but very unjust, showing. I would advocate their building much larger works, and I should be glad to contract for the supply for my sales, with a satisfactory margin for profit. In that way they could certainly defy all competition, not only in gas, but in almost every article that entered into their consumption.

I think sufficient attention has not been given by the American gas interests to the utilization of our waste products. In an article on "The Future of Coal Gas," published in the late edition of the Encyclopedia Britanica, written by Prof. James Porton, of Glasgow, Scotland, this language is used: "In the meantime new applications of importance have been found for coal gas in connection with heating and cooking, and as motive power in gas engines Further collateral industries have been superadded to gas manufacture, which in themselves are of such value and importance that, were the distillation of coal as a source of artificial light to cease, it would certainly continue to be practiced as a source of the raw materials of coal tar colors, carbolic acid, etc." If such value is placed across the water on what we largely waste, is it not possible that we in this country may make it available to a greater extent than it now is ?

I have observed but few if any changes or improvements in apparatus or working that seemed to me to promise much during the past year. However, I was very much interested in a paper submitted by Mr. Greenough at the last meeting of the New England Association of Gas Engineers, on heating retorts by furnaces, and in the discussion that followed. I was strongly impressed that something of value may be expected from this source. It is, as I understand, a modification of the Siemens furnace. I hope some of our members have paid such attention to this subject as will enable them to give us information concerning it.

As there has been no call for official action during the past year, I have nothing to report on this subject.

As presiding officer of this body, I would extend a hearty welcome to each and all. I think we have reason to congratulate ourselves on the marked improvement in our business during the past year, and the prospect for the future.

I hope the greatest harmony will prevail during your deliberations, and

that entire freedom will be felt by every member, and that our present meeting will prove both pleasant and profitable.

Hon. Thos. Butterworth, of Rockford, in a few feeling remarks, announced the death of Kerr Murray, Esq., of Fort Wayne, Ind., a member of this Association, whereupon a committee, consisting of Messrs. Starr, Howard, and Sommerville, were appointed to prepare resolutions expressive of the sense of this Association at his death.

Committee on Membership reported the following gentlemen for membership in this Association:

Mr. E. H. Jenkins, Elkhart Gas Co., Elkhart, Ind.
Mr. C. H. Raynor, Adrian Gas Co., Adrian, Mich.
Mr. R. Salter, Covington Gas Co., Covington Ky.
Mr. G. A. Hyde, Cleveland Gas Co., Cleveland, Ohio.
Mr. G. A. Hyde, Jr., Sidney Gas Co., Sidney, Ohio.
Mr. R. A. Dittmer, Troy Gas Co., Troy, Ohio.
Mr. Jas. Sommerville, Indianapolis Gas Co., Indianapolis, Ind.
Mr. B. W. Perkins, South Bend Gas Co., South Bend, Ind.
Mr. R. Spencer, Burlington Gas Co., Burlington, Iowa.
Mr. H. Merrill, New Gas Co., Janesville, Wis.
Mr. John Fullager, Cincinnati Gas Co., Cincinnati, Ohio.

Also the following as special members of the Association:

Mr. H. C. Thompson, Cincinnati.
Mr. John Stout, Chicago.
Mr. E. H. Collins, Chicago.
Mr. Carroll Collins, Chicago.

Whereupon the Secretary, being duly authorized thereto, cast the ballot of the Association, and they were declared duly elected.

On motion, the following were appointed a Committee on Discussion, viz., E. J. King, Butman, and Lindsley.

On motion of A. H. Barrett the Secretary was ordered to cause the proceedings of this meetihg to be published in the American Gas Light Journal.

On motion, adjourned until 2:30 P.M.

May 12—2:30 P.M.

Association called to order pursuant to adjournment.

Committee on President's Address presented the following report, which was adopted:

To the Western Gas Association:

Gentlemen—We the undersigned Committee on President's Address, having carefully read the same, would recommend that the following subjects mentioned therein be discussed by the Association, to wit:

Gas Engines, Gas Stoves, Leakage of Mains, Electric Light; Residuals—Coke, Tar, Ammoniacal Liquor, Spent Lime; Furnace Heating—Direct, Indirect.

All of which is respectfully submitted.

William Dunbar,
Thos. Butterworth,
A. W. Littleton,
Committee.

Committee on Membership further reported for membership as follows:

Mr. John R. Pearson, Citizens' Gas Co., Indianapolis.

Whereupon the Secretary, being duly authorized thereto, cast the ballot of the Association, and Mr. Pearson was declared duly elected.

Committee on Discussion presented the following report, which was adopted:

Gentlemen:—We, your committee appointed to report an order of subjects for discussion, would respectfully suggest the following:

1. Furnaces. Has there been material improvement in ten years?
2. Retort settings, and mode of charging.
3. Stand pipes. Remedies for obstructions.
4. Hydraulic Main. Uses and abuses.
5. Exhauster. Location and use.
6. Washing and Scrubbing. Best mode of.
7. Condensation. Theory and practice.
8. Purification. Best material for.
9. Gasholders. Proper care of.
10. Gas mains. Best mode of laying, and subsequent care of.
11. Consumption of gas. How to increase.

All of which is respectfully submitted.

E. J. King,
J. W. Butman,
Edw. Lindsley,
Committee.

Committee on death of Kerr Murray presented the following report, which was adopted and ordered spread upon the minutes:

Whereas, The Western Gas Association, holding its third annual meeting in Indianapolis, learns with deep regret that it is called upon to mourn the loss of one of its active members, Mr. Kerr Murray, of Fort Wayne, Indiana.

Whereas, For many years Mr. Murray has been identified with the gas interest of the West, and was a man of strict business integrity, of great kindness of heart; therefore be it

Resolved, That in the death of Mr. Murray this Association has lost a valuable member, whose removal from among us has created a void which will be long felt.

Resolved, That we tender to the family of the deceased our warmest sympathy in their bereavement.

Resolved, That this report be spread upon the records of the Association, and that a copy be sent to the family of the deceased.

Respectfully submitted,

James M. Starr,
James Sommerville,
J. B. Howard,
Committee.

Mr. Spencer, of Burlington, spoke as follows:

Mr. President:—It has been my pleasure to know Mr. Murray for many years, and in his death I feel that I have met with a personal loss. I have known him in business—in connection with the manufacture of gas machinery—and I have also been associated with him in a social capacity. I have been in the habit of seeing him once or twice a year ever since I became acquainted with him, and I am free to say to-day that I regard him as one of the most enterprising men, and one of the most intelligent mechanics, and also as one of the most thorough business men I have ever known. He was a man of solid mind, of sterling intellect. In all the relations of life he was recognized as a man of more than ordinary excellence of character. He was such a citizen as any city might be proud of. He maintained the character of his own city by every means in his power. He was an active member of society in all its departments, as has been suggested in a newspaper from which a friend has sent me a clipping that I will read. I most heartily concur, therefore, in the report of the Committee, realizing that its action has been timely, and of a character that will be appreciated by the family of Mr. Murray, and by all those who had the pleasure of knowing him intimately.

The newspaper clipping I refer to is as follows:

"Kerr Murray died this afternoon at half-past two o'clock, at his residence, No. 141 West Wayne street, of an affection of the heart, with which he has been suffering for some time.

"The deceased was one of the leading citizens of Fort Wayne, and his death is a loss to the community which it is difficult to overestimate. A native of Scotland, he had resided in this city upward of twenty years. He was for several years foreman of the Wabash machine shop, in partnership with Mr. Benningen, of this city. Mr. Beninngen sold his interest to the late Henry Baker, and the firm was Murray & Baker until the latter's death several years ago, since which time Mr. Murray has been the sole proprietor of the establishment. He had built up a business of immense proportions, his specialties being the manufacture of steam engines, and more particularly of gas works, which he shipped all over the United States and Canada. In this line he was perhaps the leading manufacturer of the country. Mr. Murray gave constant employment to a large number of men, and his institution was one of the largest in the city.

"The deceased was perhaps the most skillful and accomplished mechanic we ever had in our midst. He was a clear-headed, cool, and sagacious business man, full of pluck and enterprise and energy, possessed of indomitable industry, and of an integrity which has never been questioned. He had amassed a fortune of perhaps $150,000.

"The deceased leaves a wife, daughter, and a large circle of friends to mourn his loss. His age was about 54."

Mr. Starr, of Richmond—Although I have never had any business relations with Mr. Murray, my acquaintance with him has always been pleasant. He always struck me as being a very honest man. I recollect asking his advice on one occasion, in regard to a business matter—about some machinery that I proposed to him to furnish me. He was not fully satisfied that it would be to my advantage, and he said to me: "You had better just wait a while, lest there should be a mistake; I do not know yet that it would be just right." I assure you that the circumstance gave me a high appreciation of the man, for many men are anxious to do business at any time, at any risk to the opposite party. But he, rather than advise me to do what might prove to be the wrong thing, advised me to wait till he was certain about it, knowing at the same time that he could have made several hundred dollars on the transaction.

Mr. Smith, of Grand Rapids—Mr. President: I wish to add my tribute of respect to the memory of our friend who has gone from our midst. I

have been acquainted with Mr. Murray for fifteen years, and as the result of that acquaintance I regard him as having been a genial, whole-souled man, and, what is more, perhaps, a thoroughly honest man. In all of his contracts with my company I found him straight, and such I believe him to have been on every occasion. I had anticipated the pleasure of meeting him again, and was grieved to hear of his death, instead of meeting him face to face.

Mr. Sommerville, of Indianapolis—Mr. President: My personal acquaintance with Mr. Murray only dates back to the time of the last meeting of the Association, where I first met him. He was a Scotchman and you know what a tender, clannish feeling the Scotch have. He found out that I was a Scotchman, and at once came up to me and made my acquaintance, and shook hands, and we spent some time in talking about old times. And so kind was his disposition that he must forthwith make out a clear relationship between us, based upon the ground, as we discovered, that he and I had come from the same town. I took it as an evidence of his great kindness of heart and friendship. Ever since that time I have been looking forward to this meeting and expecting that I would meet him here, and that we would renew that friendship which we formed one year ago. But in the meantime death has come in between us, and I can only say that I heartily concur in the resolutions recommended by the Committee.

The Association, by a rising vote, testified its respect for the memory of their departed friend, Kerr Murray.

Subjects presented by the Committee on President's Address, were then taken up as follows:

ON GAS ENGINES.

Mr. Ramsdell (Vincennes, Ind.)—Mr. President and Gentlemen of the Association: I am sorry that I cannot present to you complete figures and facts concerning the 17-horse power gas engine now in operation in our city. This is rendered so from the fact that the Elevator Company is handling comparatively little grain at this season of the year. We have, however, operated it sufficiently to demonstrate its eminent adaptation to the work required.

The engine is one of the Otto Silent style, and nearly identical with the smaller sizes in use in this country, with which most of you are familiar—its unusual features being its size and its having been purchased in Germany. The engine was ordered through Messrs. Schleicher, Schumm & Co., of Philadelphia, in November, 1879, and was shipped from Cologne, Germany, on the 3d, of December, arriving in Philadelphia January 19, 1880, but owing to Custom House and other delays, it did not reach Vincennes until February 6.

I proceeded at once to erect a suitable foundation, and had the engine ready for action in two or three weeks. Our first operating was with the engine empty, consuming 90 cubic feet per hour. It is only very recently that the Elevator Company has been using it in their regular business. During the last month, while they were handling several car loads of wheat, passing it through the usual course, I found the consumption to average a little less than 200 cubic feet per hour. The machinery operated during this process is two elevator belts (lifting the grain in 8 and 12-inch buckets 60 feet high; thence it is conveyed by 10-inch conveyors, 135 feet in length, to the various storage bins); one ordinary wheat cleaner and fan, and one pump. At a cost of $2 per 1000, the price charged them for gas ($2.50 is our selling price), the gas used would cost, then, while handling wheat, 40 cents per hour, and, including the necessary labor in the elevator, will make an expense of a little over 56 cents per car for elevating, cleaning, and loading wheat.

One of the best features of the engine has been displayed during the period spoken of, when the receipts of grain were light and scattered. For instance, a farmer comes in with, say, 100 bushels of wheat. It is dumped from the wagon into the sink. The man in charge goes to the engine, lights the burners, and sets the machine in motion. In a very few moments the grain has passed through its process, and is in its proper bin awaiting shipment. The engine is stopped by turning off the gas, as any ordinary jet would be, and all expense ceases at once.

Thus, for any intermittent work, such as elevators for grain or passengers, printing offices, pumping, or any other light or intermittent work, they are incomparably superior to any other motor with which I am acquainted. In addition to the wheat machinery there is complete machinery for handling corn—taking it in the ear—and after shelling and cleaning it, placing it in the car ready for shipment, and with scarcely any attendance except oversight—two men being sufficient to do the work. The corn machinery used consists of the elevators and conveyors used in handling wheat: 335 feet of 12-inch drag belt, one No. 2 western corn sheller, and machinery for drawing a car carrying about 1000 pounds of corn, in sacks, from the boats on the river.

The process is this: The ear corn is situated in a corn bin about 250 feet from the sheller, and is fed on the drag belt and conveyed to the sheller. After going through the sheller it passes to the top of the building, where it is placed, after cleaning, in proper bins for storage or shipment. For this work it required an average of 300 cubic feet of gas per hour for shelling, cleaning, and loading 325 bushels of corn, or a cost of 18-100 of a cent per bushel; and adding the wages of the men employed in the elevator (8-100 of a cent), would make the cost of shelling, cleaning, and loading corn 26-100, or, say, one-quarter of one cent per bushel—a figure, considering the labor performed, which it would be difficult to approximate with steam power.

In comparing it with steam power, it would be to the advantage of the gas engine if we consider the relative *first cost*. The steam boiler and engine, with house for same, smoke-stack, etc., included, would cost at least $1000 more, considering first cost only, while the saving in repairs would be even larger than this. An engineer's wages are saved—the man in charge of the elevator starting the engine and after seeing that it has oil in its several parts (all of which are automatic), he locks the door of the engine room, and goes about his work, probably returning once in a while to see that everything is right.

I feel as though I could not say too much in favor of this motive power for the special purpose of handling grain, and I earnestly recommend its advancement by all of you. I would also say that the rate of insurance, an important item in elevator expense, is decreased one per cent. by the use of this power.

We also have in use in our city a 1½-horse power upright engine, operating the machinery in the *Daily Sun* office, and in use probably between three and four hours a day, consuming about 1000 cubic feet of gas per month, at a cost of $2.75. The work performed by the engine enabled them to dispense with labor which cost them $1 per day, thereby effecting a saving of about $325 in one year—almost the cost of the engine.

In conclusion, I would say I do not think the importance of introducing these engines into common use can be overestimated, and would be pleased to have any of you visit our city and examine the engines in operation.

Mr. Jenkins (Elkhart, Ind.)—Mr. President and Gentlemen: I have not prepared any elaborate description of the gas engine we have in operation at this time, nor any lengthy account of its operation, preferring simply to give you a few figures showing the results obtained at Elkhart. We have 3 engines at work. One of them is a 2-horse power engine of the upright pattern, and has been in use for 18 months. During that time it has averaged about 5 hours' work per day, and has consumed 49,400 cubic feet of gas, or 108 cubic feet per day—an average of 10.8 cubic feet per horse power per hour.

We have one 4-horse power silent motor, which has been in use one year, averaging 8 hours per day. It has consumed 116,700 cubic feet of gas, or 373 cubic feet per day, averaging 11.6 cubic feet per horse power per hour.

We have one 2-horse power silent motor, which has been in use 4 months (and doing the work of at least a 4-horse power steam engine), averaging 10 hours per day. It has consumed 42,200 cubic feet of gas, or 402 cubic feet per day, or 20.1 cubic feet per nominal horse power per hour.

As to the saving in favor of the gas engine, I will cite the results upon the two engines first named. The first one took the place of steam power costing the parties $225 per year, or for the 18 months, $337.50. They used 49,400 cubic feet of gas per year, which cost them, at $3 per 1000, $148.20, making a saving of $189.30.

The 4-horse power silent engine took the place and is doing all the work that a 10-horse power stationary engine and boiler did. The steam engine cost $800 per year. The 116,700 cubic feet of gas, at $3 per thousand, cost $350.10, and 10 tons of coal used in press room for heating, in place of steam that was used when the boiler was running, cost $60. Total, $410.10, showing a saving of $389.90 in one year.

In conclusion, I would urge upon all companies the importance of pushing this item of business, for with a little exertion we have increased our receipts over $800 per year.

Mr. Spencer (Burlington, Iowa)—I would like to ask the gentleman whether those engines have been running steadily, or only a part of the time?

Mr. Jenkins—The 4-horse power silent motor has averaged about 8 hours per day. It is pumping about 400 barrels of water every day, and driving three presses. One or the other of the 2-horse power engines is running nearly all the time. We carry an 1½-inch pressure for ordinary purposes. We supply power to several other parties. The railroad men there use it in setting their tires. With the compensator on, I do not think there would be any difficulty in running it with an inch of pressure. There is no difficulty about the pressure. If there was trouble anywhere, it would be owing to the volume—the lack of sufficient volume.

Mr. Hall (St. Louis)—I suppose, Mr. Jenkins, the steam engine would necessarily have to run the same length of time—that the comparative number of hours per day would be about the same in both cases?

Mr. Jenkins—When the average work of the engine is 8 hours a day, to get that 8 hours of work out of a steam engine it would have to be heated up about 10 hours; and not only that, but the engineer would have to work 10 hours, the same as the boiler and the furnace. It would be a 10-hour job all round. Of course, we have in the course of the year quite a number of days when the gas engine is not used at all, unless it is for a very short time. If the engine is wanted at any time, it is the work of a few moments only to go down stairs and start it up.

A Member—You spoke about the pumping of a quantity of water by one of these engines. I wish to inquire to what height the water is elevated, and what is the size of the pipes?

Mr. Jenkins—The water is first lifted some 10 or 12 feet, and then forced upward—a 2-inch column of water—and discharged between 30 and 40 feet above.

Mr. Sommerville (Indianapolis)—You must have a good deal more vibration there than you would have if you had a larger pipe. If you put in a 3-inch pipe you might get rid of that vibration. Here we have it in full operation four stories high, and the same pipe supplies a bank and offices, and I have never heard any complaint of the one we have here about any vibration or oscillation. I think we can get along without that. I do not believe it is necessary, but I believe it is produced by some cause—some obstruction about the pipes.

Mr. Jenkins—The 4-horse power engine is run by means of a 6-inch pipe taken off the main very near the works. The other two gas engines, on the other hand, are located several blocks distant, and still I have found the same thing to exist at both places. The engine being in the highest part of the building would make some difference.

Mr. Hall (St. Louis)—Mr. Jenkins has thrown out one thing to-day that I wish to call attention to. By his figures he shows an actual consumption of about 11½ feet of gas per hour to each horse power. Those seem to be the best figures he gives us. Now, the advertisement of these engines put it, as a maximum, at 21½ feet per hour for a horse power.

Mr. Jenkins—In the 2-horse power silent engine we are really getting 4-horse power. The consumption is 20.1.

Mr. Hall—Do Mr. Jenkins and Mr. Ramsdell think that the 21½ feet per nominal horse power per hour, which they claim as a maximum consumption, would represent the limit of power that could be got out of these engines? In other words, that the power developed by the consumption of that much gas is as far as any engine should be taxed?

Mr. Jenkins—Yes; I think so.

Mr. Ramsdell—We have to have 1½-inch pressure for our engines. When the pressure is not what they want, there is a telephone connection there, and they telephone to the works that they want more pressure.

Mr. Hall—What is the proportional loss by friction as between gas engines on the one hand and steam engines on the other? Is there not less friction—less loss of power from that cause in the gas engine than there is in the steam engine?

Mr. Ramsdell—Oh, yes; I think so. There is one other advantage possessed by the gas engine over any ordinary engine, and that is in point of superior workmanship. I have had a good deal to do with machinery in my life, but I must say that, to say the least, I never saw anything in that respect superior to this gas engine that came over from Germany. For one thing, everything about it is automatic. The piston and slide valve and their bearings are oiled. The man who has charge of it, after seeing that it is supplied with oil, locks up the engine room and goes away, and stays for an hour at a time; comes back, and finds that everything has taken care of itself while he has been away. We have a tank that holds between 200 and 300 barrels of water, but no such capacity is at all necessary; a tank holding 3 or 4 barrels would be large enough. There is a heavy stream of water running through the engine all the time.

Mr. Jenkins—Our outlet for the overflow of water is on the outside, and we find that at the top of it it gets quite hot. We have a tank of ten barrels, and we make an inlet to the bottom of the cylinder. It will run all day with 8 or 10 barrels, and in the evening the water will be too hot for a person to hold his hand in. On the engine we have, we put a circulating tank, and I think we cannot get it too large. The water will sometimes be three feet above, and cover the cylinder all the time.

Mr. Ramsdell—I did not put our engine up in the same way. I have simply a little pipe over into the sewer. Our's is uncovered at the top, and I recollect some person once threw in a little bran, and we had to go to work and clean it out.

Mr. Raynor—I think that if it was in our town, or anywhere where they have such water as we have, and the tank were filled with soft water, there would be very little trouble from this source.

Mr. Sommerville—We have one of these engines in operation at the gas works here in Indianapolis, at the office, and it will give us much pleasure to see any or all of the members of the Association down there. We would take pleasure in showing you not only the gas engine, but all of the works.

Mr. Jenkins—We have an engine running all the time, and will be glad to have any of the members call and witness its operation.

The President—I recollect that I myself electioneered pretty hard to induce a party to buy the same engine that you are now putting up.

GAS STOVES.

Mr. Starr (Richmond, Ind.), opened the discussion as follows:

Mr. President—It is an unexpected thing to me to be called upon to speak to the Association on the subject that is now before us, although, as a matter of fact, I have some familiarity with it, as we have been using gas stoves in our town for about twelve years now. We have a number of persons who use them for cooking purposes, but their use is limited, notwithstanding the large number of persons who have them in their houses.

There is with us, as I suppose there is everywhere, a strong prejudice against the use of gas, but where the necessary cooking is small, they do use them. The consumption for that purpose is quite small, even with large stoves.

In regard to the different kinds of gas stoves that are in use, I do not wish to be considered as soliciting for the Goodwin stove, but I must say that there is a remarkable degree of excellence in them with respect to broiling. The heat is reflected directly upon the meat, and there is no burnt grease anywhere about the meat. I think myself that it is decidedly to the interest of the gas companies to favor and encourage the general introduction of gas stoves.

When we went into this department at first, we were dealing in gas stoves and fixtures, and the proposition we made to the people was, that if they took our gas stove and tried it, and it was not satisfactory, we would take it back. We never had to take back a single one of them. As to capacity, I think I am safe in saying that a very good meal for four or five persons can be cooked on a gas stove for 1½ cents.

I see that the gas companies generally are moving in this matter to a much greater extent than they did a few years ago. There are many reports from the east in regard to it. The recommendation has been made by some that we should sell gas cheaper to families that use gas for cooking purposes. I would not recommend the idea of putting two meters into one house, of which one would measure the gas used for cooking, and the other that consumed for light. It seems to me very impracticable. Besides, I am satisfied that gas is cheaper than wood at $3 a cord.

A member desired to know what pressure was used.

Mr. Starr—The pressure we use is about nineteen-tenths. I think an inch pressure would do it. It might vary somewhat, according to the size of the opening in the stove. The stove is generally set pretty near to the back end of the house, and, of course, situated there, it would not work well unless there was more pressure there. It would require more pressure than elsewhere.

The method of attachment is something like this: The gas pipe generally rises at the front of the house to the floor of the second story, runs along horizontally from that point till it reaches the kitchen, and then descends inside the wall and comes out at whatever point you please, so as to be most convenient. We have stationary shelves made, that we used to buy by the hundred and furnish to customers. The shelf is fastened against the wall, and then we take a piece of zinc, about 18 inches square, and nail it against the wall. Our population is about 15,000, and we have 590 dwelling house consumers, and nearly all of them use gas for cooking, and so do nearly all of the hotels.

Mr. Hall—What is your minimum pressure?

Mr. Starr—Nineteen-tenths.

Mr. Hall—Suppose you use a three-quarter inch pipe, what is the minimum pressure you can then run with?

Mr. Starr—I do not know positively—I think five-tenths would run it, and be as effective.

A Member—Have you tried any other stove but the one kind you have been speaking of?

Mr. Starr—Yes, sir; the first stove I ever tried was a stove from Cincinnati, which was an excellent stove in some respects. Then we tried one made in New York, and that was an excellent stove; and of that we sold a great number. And then the retort stove came, and we thought it was a great improvement. I do not think there is any smell of gas at all. We have no smell whatever from gas cooking.

The President—What is your experience as to its success in baking?

Mr. Starr—We sent out to a baker's and got a loaf of bread just ready for the oven, and our gas stove baked it nicely in three-quarters of an hour with six feet of gas. For two years before I quit keeping house there was scarcely anything eaten at our house that was not cooked by the gas stove, and I think that the retort stove has answered very well, although we have had some complaints of them.

Mr. Dunbar (New Albany)—My experience with gas stoves is only in an individual way. I tried one at my house eight months or a year ago, in-

tending, of course, to introduce them. Where attached the pressure was not strong enough to be a success, and I gave it up for a while. Then I concluded to try it again, and I went to work and ran a three-quarter inch pipe from the cellar under the front part of the house, where the pipe entered, back through the cellar to the kitchen; there I turned it and ran it (three-quarters of an inch) right up to the stove. Then I found we had a six-tenths pressure, and with that we got along very well. It is with the gas stove in this respect as it is with the gas engine: it is *volume* you want.

Mr. Howard (Dubuque)—On last Sunday I acted as cook. In the morning I cooked a beefsteak on a No. 5 Goodwin stove, and when it was placed upon the table I must say it was most excellent; I never relished a steak better in my life; it was tender and juicy—very. Well, for dinner we were to have a roast, and I had intended to cook the roast in the other stove, but after my success with the beefsteak I told my wife I thought I had better put it into the oven of the gas stove. So we cut the roast into halves and put it in. I did not time the process of roasting, but in regard to the roast itself, I must say it *was* a roast; in the centre nice and rare enough to suit any taste and satisfy any person who has a preference for that style of cooking, and from centre to circumference, in beautiful progression, there were morsels adapted to every appetite. The whole thing was a sight to stir and enrapture any carver's heart. (Loud laughter and applause.) Well, I do not believe in doing unnecessary cooking on Sunday, and thought, with our tender steak at breakfast and the roast at dinner, we might let the gas stove rest till next day. But all at once my wife says to me, "I would like to try a cake; let's roast our meat and see if that stove will bake us a nice cake at the same time." Now, as I say, I had my scruples (laughter); but I yielded—I gave way. (Laughter.) I went to work and helped get up the cake. (Laughter.) Ye prudes in virtue, say! say, ye severest, what would you have done? (Great merriment.) Well, we got up our cake, and baked it in that gas stove, and my wife declared that, of all the ways between heaven and earth to bake a cake, that was the best.

Now, Mr. President, in regard to the matter of pressure. My observation is different from what has been related here yet. My connection is 58 feet away from the front line of the building. I have an eight-tenths pressure, and the stove is fed by means of a very little cock that comes out of the kitchen wall. What I mean about pressure is, that eight-tenths pressure is all I have at the house.

When I get back home again I mean to push the gas stove business, for I believe that if the proper amount of effort was put forth the daily consumption could be increased immediately. The gas cooking business is not new. I recollect very well 28 years ago, when I was a gas fitter in the city of Brooklyn, we got up a gas men's supper, and every dish that was put upon the table on that occasion was cooked by gas; and it was no small affair either. We had beef roast, mutton roast, leg of mutton, and all things that would be at a regular supper. The man who arranged and managed the thing was an Englishman by the name of Powers. It was understood, and a point was made upon it, that every article cooked, without a single exception, should be cooked upon the gas stove. The beauty of cooking by gas is, with regard to beef, the gravy. In the gas cooking process you are not troubled with burning or burnt pieces of the meat, nor does the gravy have that dirty color which it is next to impossible to prevent in cooking in the ordinary way. My wife (returning to our home experiment) said: "What is the matter wiih the gravy—it is so clear and nice?" And then there are so many people suffering with indigestion. (Laughter.) I believe that even indigestion can be cured to a great extent, and in a brief period, by the use of the gas stove. (Loud applause and laughter.)

Mr. Hyde (Cleveland)—About three years ago I procured a lot of gas stoves. The gas stove had been sold in some of the stores there before that time, but not with very great success; so I procured some and let my son have them—thought I would see what he could do with them. We only got a few. I took the first one that was taken, in order to that I might be able to recommend it to others if it deserved any recommendation. We found some little difficulty in getting the gas to burn well. We found that the central tube was too small—it was only one-eighth; so I took the stove to pieces and put in a larger pipe, and it removed the trouble. I then wrote to the secretary and told him what the difficulty with the stove was—the tube being too small. We keep our pressure down to eight or nine lines in the daytime, but the pipes being large, the stove worked well. They now make them larger than they did before, and the success is much better. We have made two quarts of coffee, cooked sufficient meat, potatoes, etc., for a family of six persons, and at a cost of eight mills, where gas sells at $2 a thousand feet. There can be no difficulty in getting a breakfast for any ordinary family at an expense for fuel of one cent. As to the pipe that leads to the burner, in my case I had about 8 feet of pipe right to the stove—half-inch pipe. I do not know how they are making their stoves now, but the pipe should be large enough to bring the gas to the point of consumption with eight or nine-tenths pressure.

Mr. Butterworth—We have been cooking with gas in our own family, consisting of eleven persons, and have not used wood or coal for a good while, and we manage to get along at at an expense of one cent per day for each of the eleven. There was a time when I felt satisfied our girls were using the gas in the winter, when the weather was pretty cold, to help keep the room warm, and it then brought me in for about 30 cents a day; but when I watched carefully, and saw that the gas was used only in the proper way—for cooking—I very easily got it down to 11 cents a day. The cooking pleased us all, and I concluded to invite in the preacher and the doctor, and they were both satisfied with it and wanted to come again.

Mr. Dunbar—The way I happened to get my gas stove was this: While I was on my way to the meeting of the Association in Chicago, one year ago, I and my friend Mr. Barrett stopped over at Indianapolis and called upon Mr. Pearson at the gas works here. After spending some little time there we took our departure, but in making a tour of the city it so happened that we passed Mr. Pearson's house, and he saw us and made us come in. We told him we did not have much time to spare, but he insisted, and said, "Come in, and I'll cook a steak for you on a gas stove." We went into the house, and in, I think, three minutes he had cooked as nice a steak as I ever tasted. That satisfied me as to the gas stove. I wanted no more evidence to convince me of the great value of the invention.

Mr. Pearson—That stove is a No. 7 Goodwin. We have used it to do the cooking for one family, and the figures so far are about 17½ cents per week. That includes baking, ironing, and everything.

Mr. Starr—We have 590 dwellings, and 500 cook with it more or less, and some of them cook with it all the time. One of these men told me his gas bills last year was $23.75, and another $22.26. We have only the single stoves. What we call a stove is the one burner. We do not have any two-burner stoves.

Mr. Lindsley (Cleveland)—The remarks of Mr. Hyde make me recall my own experience in connection with gas stoves. I have used a gas stove now for about two years. When I first got it I did not use it to its full capacity, and it was, I thought, economical when the amount of cooking was small, but where you have to heat a large quantity of water for washing, or have to keep up the heat for ironing purposes, there, I confess, I doubt its utility in an economic point of view. On the other hand, you can cook a breakfast for a family of seven or eight persons a good deal cheaper than you can build a fire in a coal or wood cook stove and cook in that way. It will cost you less than other fuel. Right there, I think, the economy of the gas stove is apparent to everybody; but as to its use for the heavier purposes, I would have to see its capacity demonstrated before I would be willing to take much stock in it.

Mr. Pearson (Indianapolis)—I differ with some of the gentlemen who have spoken in regard to the use of gas stoves for ironing purposes. With the No. 7 Sun Dial I can heat five flat irons at once by simply laying a piece of sheet iron over the top. I use them in preference to the wood stove for economy and convenience.

The next subject taken up for discussion was the "Leakage of Mains," pending which the Association adjourned until nine o'clock A.M., May 13.

[To be continued.]

[Official Report.—Continued from page 252.]

Proceedings of the First Annual Meeting of the Central New York Gas Engineers' Association

HELD AT THE GLOBE HOTEL, SYRACUSE, NEW YORK, MAY 20TH, 1880.

Mr. Harrington—I think that the whole theory and experiments of Mr. Aitken tend to show that we reduce our temperature too abruptly, and separate our tar too soon.

Mr. A. C. Wood—The conclusion we arrived at at our meeting three months ago seems to be identical with this.

Mr. Harrington—I wish to correct the statistics obtained at that time, which represent the distance from my condenser to washer as six feet. It should be sixty feet.

Mr. A. C. Wood—Similar results to those quoted to-day were obtained by Capt. W. H. White in experiments at the Citizens' Works, Brooklyn, by heating his tar and gas together. Mr. Cartwright, of Oswego, was also requested to prepare a paper on this topic, and perhaps it would be well to have it read at this point.

Mr. Cartwright spoke as follows:

Mr. President:—I have not prepared a paper, as I have had little experience personally with naphthaline; but by reading I have formed an opinion as to its cause and possible obviation, and the ideas so gathered I will endeavor to impart.

All authorities agree on two chief causes of the deposition of naphthaline, viz., a sudden reduction of temperature and the presence of aquous vapor.

Several systems having these causes in view have been proposed as remedies. Prominent among these is the one mentioned to-day. I consider Mr. Aitken as good an authority on naphthaline as there is in the world. In his analyzer, as he terms it, the tar is heated and the light vapors volatilized and are mixed with the gas. At a given temperature the light vapors are retained by the gas and the heavy vapors deposited. Major Dresser, at Cincinnati, in 1877, gave to the American Gas Light Association a translation of the prize essay of Bremond, who demonstrated by experiment that aqueous vapor in the gas caused the deposition of naphthaline. He found naphthaline more frequent at the outlet of his station meter and holder than at the inlet, due to the contact of the gas with water in the meter and holder. He first passed a current of gas through glass tubing, containing chloride of calcium, to remove the aqueous vapor, and then through tubes packed in ice to effect a sudden condensation. No naphthaline was deposited. He then passed the current through water to absorb aqueous vapor, and then, on refrigerating, naphthaline was deposited, proving that if the light tar vapor is retained it solves the naphthaline and enriches the gas. Certain vapors, under favorable conditions, have an affinity for each other, others not. If we stir lampblack and water together, they don't mix; but if we throw lampblack into oil the two mingle. There is an affinity between the two. So with gas, when the moisture is removed the affinity for the light vapors is manifest and the naphthaline is retained, enriching the gas. In the presence of moisture the affinity ceases and the naphthaline is deposited. There is no accountable cause for the changes in candle power which we all experience, unless the change of temperature in our pipes affects the watery vapor in the gas. The introduction of thermometers is therefore beneficial with a view to keep the gas as warm as possible up to the point of distribution.

Further, Bremond put oil in the station meter, holder, and drips, so that the gas would not come in contact with the surface of the water.

Gas varies with temperature, change of season, depth of pipes, etc. Naphthaline forms mostly in Spring and Fall, because the change in temperature is radical and of wider variation than in mid-Summer or Winter. I can say then, in conclusion, that acccording to the best recognized authorities the rule is to keep the gas as free from watery vapor as possible. Although there is a question in my mind whether the excessive drying of the gas by such agents as chloride of lime would not have a deleterious effect on the diaphragms of our meters.

My greatest deposit instead of being at the outlet of my meter and holder is in the condenser (multitubular), and chiefly in the inlet at the washer.

The President—I don't quite agree with Mr. Cartwright on one point. Our greatest condensation is in mid-Summer when the gas in the holders is warm and that in the mains comparatively cool. Hence, I would not build a holder of any size without cover.

Mr. Humphrey, of Dansville, then read the following paper on—

OIL GAS.

Mr. President—At the request of the Association, at our last meeting, held in Rochester, Feb. 19th, and my own desire to contribute something from my experience in gas making, for amusement or instruction at our meeting in Syracuse in May, I submit the following as to what we have done in making gas from naphtha on a small scale, well knowing how uninteresting it must be to coal gas men generally, though it may be where coal gas is made on a very small scale, the margin is perhaps not so satisfactory as with us who use naphtha; or, perhaps, coal gas can be made with good profit on as small a scale as we are working, and this may be a means of bringing out from some one how small a consumption of gas can be supplied with a coal gas works more profitably.

Three years ago we leased the gas works in Dansville, Livingston County, New York, and put in apparatus (designed by Mr. Chas. Deaves of New York), for making oil gas. On the 19th of July, 1877, we started the fire, with gas coke for fuel, and crude petroleum to make the gas from, diluting the rich oil gas with wood gas and air to a quality of about 20 candles, until August 23d of the same year, when we completed our mixer and put it in operation; this we have used satisfactorily ever since, mixing six of gas to four of air.

In making the gas some wood is used, as will appear below, making an article of gas which, when diluted as above, burns splendidly through a four feet burner—a five feet burner is the largest that we can use satisfactorily.

The bench is constructed similarly to some coal gas benches, the settings being very light so as to heat up quickly; three retorts to a fire going through and out of arch at each end. The retorts are D-shaped, internal dimensions $5' \times 8\frac{1}{2}'' \times 7''$, made open at each end. Four feet of the length of retort in the heat when working, six inches of each end of retort required to reach through walls to attach the mouthpieces. At one end the oil-supply pipe enters, at the other is the stand pipe.

When operating, a stick of cord wood is put into each retort and closed with luted lid, as in coal gas works. When the wood is somewhat charred, a small stream of oil is turned into each retort which, upon entering is at once converted into vapor, which traverses the whole length of retort over the hot charred wood, and enters the stand pipe a fixed gas; thence to condenser, purifier, and meter to holder, then from holder to mixer where it is diluted and goes into the mains in the street.

This gas needs but little purifying. We use one bushel of lime and two bushels of charcoal to about 50,000 cubic feet of pure gas with some shavings as scrubbers. We used petroleum only a short time, and changed because it choked the pipes and retorts; we found naphtha to work much easier and it was also cheaper.

Our holder is of about 8,500 cubic feet available capacity, which we fill with rich gas, then let the heat go until the stock of gas in holder is low, then start the fire and again fill the holder, and so on.

The labor attending running the bench is very light, being merely attending a coke fire, and letting on oil according to the heat. There is no trouble with stand pipes choking when the flow of oil is regulated according to the heat; but if the flow of oil is insufficient the stand pipe will choke and the retort be filled with a fine soft carbon or lampblack. On the other hand, by running too much oil for the heat, the pipe from hydraulic main to purifier becomes choked with a very soft, oily mud which, upon being agitated, becomes limpid. There is no trouble from choking beyond the purifiers, but we have some condensation in purifier. In the meter and the inlet drip to holder, and also in outlet drip, the condensation is very light, being not much heavier than naphtha, which we work over again. In the two and a half years' working we have not found any condensation in any one of the street drips.

I think our meters and tips of burners last quite as long as with coal gas.

COST.

As to cost of running these works I have made out from the books a statement of what we have done from July 19th, 1877, to January 1st, 1880—

Pure gas made per station meter		1,783,500 cu. f.
Diluted gas sent out per mixer		2,560,700 "
Gas sold per consumer's meters	2,300,700 cu. f.	
" street lamps, estimated by burners	189,000 "	
Gas used at works, estimated	21,000 "	
Gas unaccounted-for, less than two per cent.	50,000 "	
		2,560,700 cu. f.
Naphtha used, including petroleum		25,210 gals.
Hard wood (kiln-dried)		26,402 lbs.
Burned out retorts, six, aggregate weight		3,800 lbs.
Gas coke used as fuel		3,104 bush
Lime		48 "

It will be seen from the above that to make 1,000 cubic feet of rich gas we have used 14.13 gallons of naphtha and 14.80 pounds of wood, or 70.7 cubic feet of rich gas from one gallon of naphtha and one and a small fraction pounds of wood.

And, further, we find that one gallon of naphtha and one pound of wood yields 100 cubic feet of diluted gas as sold to consumers.

Upon comparing the above figures as to rich gas made per station meter, and diluted gas sent out per mixer, we find quite a variation from the actual capacity of the two drums of the mixer—that for gas being six, the other, for air, four.

The amount of rich gas made being	1,783,500 cu. f.
The diluted gas sent out is	2,560,700 "

making the actual percentage of gas and air to be 67 to 33 instead of 60 to 40. This variation I account for in a measure by the gas passing through the meter not thoroughly cooled, and also by the fact that the gas enters the mixer under a pressure of two and seven-tenth inches, while the air enters under a slight vacuum.

All the force employed at these works is one man, beside myself, and we find time to do all the pipe fitting we can get for gas, steam, and water.

Our average daily consumption is 2,858 cubic feet. The quality of gas sent out is about 20 candles. With one fire we make about 600 cubic feet per hour on an average, and when the heat is high the yield per hour will go up to 800 cubic feet.

Mr. Cartwright—What photometer do you use?

Mr. Humphrey—My eye. I have ordered a jet photometer, but have not received it.

The President—How many miles of pipe have you?

Mr. Humphrey—We have no map of our mains; but probably have 2, or $2\frac{1}{2}$ miles.

The President—Do you have any trouble from stratification?

Mr. Humphrey—Not in the least.

The President—Any change in pressure causing the lights to blow out?

Mr. Humphrey—No, sir.

Mr. Kingsbury—How is the mixer made?

Mr. Humphrey—It consists of two wet meter drums.

Mr. Kingsbury—Whose process is it?

Mr. Humphrey—The works were designed by Chas. Deaves.

Mr. McDougall moved a vote of thanks to Mr. Humphrey. Adopted.

Mr. C. A. White, of Rochester, then read the following paper on—

IRON SPONGE.

Mr. President and Gentlemen of the Association:

The use of a new material for the purification of gas, known as "iron sponge," has for some little time been attracting the attention of the profession, and quite a number of companies are now using it with marked beneficial results.

Iron sponge is obtained by treating the oxides of iron in contact with carbon at a suitable heat, with practically complete isolation from the atmosphere.

It retains the general shape of the ore from which it is derived, though expanded in bulk and showing a marked loss of weight.

The sponge consists of the now volatile matter of the raw ore; that is, the portion not capable of volatilization, either by the degree of heat employed, or by contact with carbon.

The loss of the volatile matter separating from the ore leaves minute cells throughout its entire mass, rendering it extremely sensitive to chemical action.

Before entering into a consideration of the action of gas upon the sponge, it will be better tnat I should allude, briefly, to the manner of preparing the sponge for the boxes, the process being simply to wet the sponge, turn it over until the mass is thoroughly wet through, or rather moistened, so as to adhere slightly when pressed in the hand.

Regarding the chemical action of the gas upon the sponge, not having any apparatus for experiment, I submit the opinions of Mr. Robert Young, Engineer and Superintendent of the Allegheny City Gas Company, who states that the iron contained is partly a hydrated sesquioxide, Fe_2O_3HO, this is placed in the purifying box, and the sulphuretted hydrogen, SH_2, brought in contact with it. The three atoms of oxygen combine with three atoms of hydrogen, and form water, and three atoms of hydrogen are liberated; and the sulphur combines with the iron and forms sesquisulphide of iron (Fe_2S_3); on exposure to the air the oxygen displaces the sulphur, and the iron reoxidizes. Thus it continues until we have more sulphur than iron (for it increases in bulk every time it is used, the increase being stored away for future use), and we have reduced the iron and increased the sulphur so much that it will not pay to handle it.

Now for the CO_2. The material holds a large amount of water, that takes up any NH_3 that may pass the scrubber; that will neutralize the CO_2 and form NH_3CO_2HO.

If I find, on testing the gas after it leaves the purifying boxes, any CO_2, I let a little more NH_3 pass the scrubber, and that neutralizes it; and there is no trouble unless I get more NH_3CO_2HO than the water is able to hold, when it would pass off with the gas, though I have never found that to be the case yet.

When we charge a box and expose the material to the air, the rapid oxidation of the iron causes the mass to become very hot, but not red hot, and the carbonate of ammonia and water is evolved, which is readily detected on going into the room; but there are no obnoxious odors, as there are from lime.

Prof. George Hay, analytical chemist of Pittsburgh, Pa., says that iron sponge has been manufactured for years in England and Scotland for the purpose of filtering water—depriving water contaminated by organic impurities of their sulphur, which remains with the iron as sulphide of iron. Organic phosphorus compounds are also decomposed, phosphosus and sulphur being removed, together with mechanically suspended impurities, leaving the water hardly, if at all, putrescible.

Its minuted state of division and its porosity increase its affinity for sulphur in any form.

In iron sponge purifying material the iron exists as hydrated sesquioxide, in which condition its affinity for sulphur in the form of sulphuretted hydrogen, sulphocyanogen, sulphide of ammonium, or other sulphides, is very strong.

Having thus considered the preparation of the sponge and the action of the gas thereon, let us look upon the working results that have been obtained by its use, under which would naturally arise the question—Does it fulfill the claim of the manufacturers in an increased purification of gas per bushel?

Is there any reduction in pressure?

Is there the same amount of obnoxious odors present as in the use of lime?

Can we claim a saving not alone in material, but in labor?

It certainly does give an increased purification per bushel, as actually demonstrated by its use at the works of which I was engineer. It is needless for me to enter into the details of how we came to adopt the iron sponge at our works. Suffice it that in December, 1879, we commenced its use.

I will here add that I was at the outset somewhat afraid that it would not prove to be what it was represented, as the boxes required to be charged so very often, and the material only purified 1600 cubic feet per bushel. Still I was partly prepared for this, as I had been informed that it required sometime to develop its merits.

Mr. Young's statement of the chemical action shows exactly why this is so. The second charge of the boxes—that is, the second time the material was used showed a purification of..... 2000 cubic feet per bushel.

Third time	2500	"	"
Fourth time	3025	"	"
Fifth time	4120	"	"
Sixth time	5460	"	"

and gradually increasing until a maximum of 12,710 cubic feet per bushel has been obtained.

I propose to compare, briefly, the results of the months of February, March, and April, of the years 1879 and 1880, the former using lime, the latter the iron sponge:

February,	1879,	lime	6,250	cubic feet	per bushel.
March,	1879,	"	7,268	"	"
April,	1879,	"	5,900	"	"
Or an average of			6,472	"	"

For the same months, using the iron sponge—and that not nearly up to what it should do—has done:

February,	1880,	iron sponge	6,200	cubic feet	per bushel.
March,	1880,	"	9,882	"	"
April,	1880,	"	11,300	"	"
Or an average of			9,127	"	"

showing an increase over lime of nearly 41 per cent.

The largest amount purified per bushel up to date has been 12,710 cubic feet.

The number of days boxes lasted were—

	February.	March.	April.
1879. Lime	4	6	6
1880. Sponge	7	15	15

Total gas manufactured during 3 months of 1879.... 12,404,000 cubic feet.
" " " 1880.... 13,431,000 "

Or an increase of 8 per cent. over 1879.

The decrease in pressure, as shown at inlet to centre seal, was two-tenths of an inch, and this has remained since using sponge.

There is certainly an absence of most of the obnoxious vapors that are present with the use of lime, and the men who do the work state that it does not have the same deleterious effect upon the eyes, and much prefer its use.

The question of saving is an important one, and must not be overlooked. The cost of lime used at our works during the year amounted to $700. The cost of the iron sponge was $550.

The claim is made that it will last for two years. Allow it to last only 18 months and we have a saving in material alone of $500. There is also a saving in labor.

As shown in this report, the average life of a box of lime was 5½ days during the period of 1879, as against 12½ days during 1880—a gain of 140 per cent., not taking into account the increase of 8 per cent. of manufacture.

During 1879 one man was continually employed in preparing the lime, filling boxes, and wheeling away the refuse or spent lime, the wages paid being $2.25 per day, or $67.50 per month. With the iron sponge the labor is reduced to a minimum, and as its preparation does not require any particular skill, ordinary laborers can be employed, allowing 2 men ½ day each in filling and the same in emptying. We have 2 men, 1 day each, or 2 days at $1.25=$2.50.

When the sponge is taken out af the boxes it is spread upon the floor to a depth of 8 or 10 inches, where it is allowed to remain for two or three days, when the same men will occupy one hour in turning it over—this being repeated two or three times, when the sponge is wet down and stacked ready for use; all this entailing a cost of, say, 2 men, 4 hours=8 hours, at $1.25=96 cents.

The labor account with lime, per box	$13.50
" " sponge, "	3.46

Of course this refers to where only ordinary laborers, such as we employ in the yard, are used. Where the regular purifying man is retained, the cost will increase.

There is also a saving in the cartage away of spent lime—not only an expense, but a question of room for dumpage. This is entirely done away

with, and there are no unsightly and costly monuments to the memory of departed funds, laid away in material, labor, etc., in our purifying houses.

Mr. White, in answer to questions by different members, then stated:

There has been an increase in bulk from 1000 to 1200 bushels in five months.

After taking the sponge from the foul box, two men pile it 18 inches thick. It heats up, throws off the ammonia, and it is then spread to eight inches thick and allowed to cool.

Since December 13, 1879, I have had no extra paid help in the purifying house. The hands work two hours every other day. I use one layer of lime; but this is not renewed, going back into the box every change.

Mr. Cartwright—How much did your purification by lime cost per thousand?

Mr. White—91-100 of a cent.

Mr. Cartwright—How much did you purify per bushel?

Mr. White—6,500 feet. I cannot tell what the cost per thousand for the sponge will be until we know how long it will last, so that we may know what proportion to charge per month.

Mr. McDougall—What did the sponge cost per bushel?

Mr. White—When I purchased mine it cost fifty-five (55) cents. There has been a slight advance since then due to the rise in iron.

Mr. Parish—Mr. President, if it is in order, I would like to have the question of "leakage" discussed. Some members claim a make of six feet, and only five per cent. loss by leakage. I have hard work to get five, and my leakage is more than ten per cent., this in difference between make and sales. Figuring my loss per mile of main my showing is not so bad; and, it seems to me, a fairer comparison of results can be reached by taking the loss per mile of main than by the other method.

The President made the following remarks:

The question of a fair comparison of the amount of leakage is a difficult one—the conditions vary so much in different localities. By referring to the discussion of this question by the American Gas Light Association, the members will see that it is one of the most difficult questions imaginable to arrive at a uniform rule. For example, in Syracuse, a large part of the city is made ground, on what was once swamp land, and miles of our pipe are under water the year round. The soil is yielding and we have frequent breakage, both in mains and services.

It necessitates an annual inspection of the whole line of pipe. Last year we found five bad breaks in the mains.

These breaks were discovered by inspection, there being no smell of gas on the line, although the soil was saturated. Hence, it will be seen that our leakage must be vastly more than in a place like Rochester, where the soil is firm, much of the pipe being laid on rock bed.

Before we adjourn there is another subject I would like to bring up, and that is fuel gas. During the year a series of experiments by Mr. Dunning, of Auburn, and myself, conducted independently, but arriving at the same result, have demonstrated that gas as a heating agent running night and day during the cold season, is not available. Actual meter tests of gas applied in the most economical manner, with this end in view, have demonstrated that gas, as compared with anthracite coal at $4.00 per ton, is worth at the outside six cents per thousand feet.

For cooking, on the other hand, its efficiency and economy has been proven beyond a peradventure, the work being done in so short a time, but little gas is consumed in the operation.

Miss Corson, of the New York Cooking School, has just finished a course of lectures here. She used two stoves, each of the capacity of a number 9 "Sun Dial," lecturing an average of four hours daily for two weeks. In this time she used $3.37½ worth of gas at our present price of $2.50 per thousand.

No other topics for discussion being introduced the committee appointed to consider the advisability of changing the Constitution reported in favor of making the meetings semi-annual.

The report was adopted, and, on motion of Mr. Kingsbury, the rules were suspended, and Article IV. amended to read—

"The regular meetings of the Association shall be held semi-annually, on the third Wednesday of April and September of each year, at such place and hour as shall be directed at the previous meeting," etc., etc.

And that Article XVI. be amended to read as follows—

"The Annual Meeting of this Association shall be held on the third Wednesday in April of each year."

The Association then adjourned to meet at the St. James Hotel, in Bradford, Pa., on the third Wednesday in September.

Fine Lubricating Oil.—Put fine olive oil in a bottle with scrapings of lead and expose it to the sun for a few weeks. Pour off the clear oil for use.

[From "London Times."]

Coal Gas Illumination.

When illumination by means of electricity was introduced in our thoroughfares on a practical scale about 18 months since it formed such a marked contrast to the ordinary methods of gas illumination, greatly distancing them in brilliancy, that it was not unnatural that it should appear to the unreflective public mind that the days of gas were practically numbered. The possibility of gas illumination for public thoroughfares being capable of improvement was the last thing to be realised by some, while others, to whom such a possibility did occur, gravely doubted its probability on account of the great cost which they conceived anything like a substantial increase in light would involve. True, they knew what could be and what was being done in shops and private houses to obtain a good light from gas, but they also knew what the luxury cost, and they inferred that the cost of a proportionately liberal display of gas in our streets would be simply prohibitory. And so it would if the gas were burnt upon the same injudicious and unscientific principles which have hitherto very largely obtained in private houses and other establishments, and which still do obtain to an almost incredible extent. That the deficiencies of our street illumination, however, are not due to the impossibility of obtaining a better light by the aid of gas except at a prohibitory cost was amply proved on a large scale in three instances during last year. These were the special lighting of a portion of the Waterloo Bridge Road, of Waterloo Place and part of Regent Street, and Queen Victoria Street, a generous, but not extravagant display of gas being exhibited in each case. The immediate result of the experiments was to show most conclusively that in order to obtain a good light the conditions of illumination must be considerably modified and the cost somewhat increased but not to anything like the prohibitory extent imagined by some. All this we clearly pointed out at the time, and our facts and figures remain for reference. The practical outcome of these experimental displays has been the adoption in many parts of London and the suburbs, and in many of our provincial towns, of the methods of gas illumination then employed. These applications have not, however, been made indiscriminately. The improved burners have been judiciously distributed on refuges, in wide streets, and at the intersection of thoroughfares where the traffic is heavy. Their success continues, while their adoption increases.

The reason why gas illumination in general is so inferior is largely due to the prevalence of motives of economy, which economy is, as a rule, a false one, owing to a prevailing ignorance of the correct principles upon which gas should be burned. It is almost universally assumed that if the gas is not "hissing," as it is called, with an ordinary bat-wing or fish-tail burner, or is not issuing forth in red flames from the chimney of an Argand burner, all must be going on well. Never was a greater mistake, for without these palpable indications of waste the veriest extravagance may be, and generally is, going on, and this from the absence of any controlling power over the pressure of the gas from the main, which science has of late demonstrated to be one of the first essentials of economy. Nor is it only the consumer who is ignorant on these points; many a gas fitter to whom he entrusts his interests is similarly uninformed. Were it not for his ignorance, the fitter might be suspected of playing into the hands of the gas companies, by reason of the gas-wasting-fittings he supplies to his and their customers. Nor should the action—or rather inaction—of the gas companies pass without notice here. They remain perfectly apathetic under the circumstances, and, although it is not compulsory that they should show their customers how to use in an economical manner the gas that they supply to them, they at least lay themselves open to suspicion when they knowingly allow users to waste it from sheer ignorance. That "they manage these things better in France" is perfectly true in this, as in some other respects, inasmuch as the Paris Gas Company have several depots in the city for the exhibition of such burners and other gas appliances as they can recommend their customers to use.

The company, we believe, are not traders in this respect; they are simply the exhibitors of other people's goods, bnt then they exhibit nothing of which they do not approve. Gas users make their selection at the depot, and order either through their gasfitters or purchase for themselves at the makers of such burners or other articles as they may require, knowing that they bear, more or less, the guarantee of the Paris Gas Company.

The exercise of a controlling power over gas during burning has formed one of the chief studies of gas engineers ever since the first practical introduction of gas lighting. And it moreover continues to do so, notwithstanding the great advances which have been made in gas lighting in recent times. The power of control is the key to the efficient and economical use of gas—that is, the production of a good light at a low cost; and this governing power largely underlies all the most substantial improvements that have been made in gas lighting. It was the satisfactory solution so far of this question which enabled the gas companies to show a bold front when the electric light threatened to invade their territories, and it is that which

will materially assist them in meeting the invasion now that it has practically commenced. It is undoubtedly due to the electric light that some of these means of improved gas illumination have been brought prominently before the public, while it is not less due to it that others have been developed into existence. It may therefore prove interesting at the present juncture if we point out the direction which improvement in gas lighting has taken, and the means whereby such improvement has been accomplished. To render this clear it is desirable that we should revert to the first principles and the early practice of gas lighting, and briefly describe the gradual stages of development through which gas burners have passed from their primary crude state to their present comparatively perfect condition.

Upon the introduction of coal gas as a means of artificial illumination the object of its advocates was to render it an efficient substitute for the oil lamps and candles which were the only practical means in general use for obtaining artificial light. They therefore imitated the flame of a candle by boring a little hole in the stopped end of a small cylinder, through which gas issued under a slight pressure. On being lighted a flame resembling that of a candle was produced, and this kind of burner is known as the single jet or rat-tail burner. It is of little use in artificial lighting, and has long since become obsolete except for illuminating devices and cigar lighters. The imitation of the old Argand oil lamp flame was readily effected by adapting the burner itself. The top of the annular space where the wick came out was covered in with a flat metal ring perforated with a number of holes, the gas being admitted where the oil was previously supplied to the lamp. Many old oil lamps were in this way converted into gas lamps. It was, however, soon found that if gas were made to issue under pressure from a slit cut across the stopped end of a cylinder it produced a flat flame. This kind of burner, being much less expensive than the argand, and not requiring a glass chimney, consequently came largely into use. This burner received the name of the "batwing," from the fancied resemblance of the shape of its flame to the expanded wing of a bat. It does not appear to have occurred to any of the early gas engineers that the loss of illuminating power in these burners was very great, in consequence of the over-oxidation of the flame through the velocity with which the gas issued from the orifice. Another kind of burner even more destructive to the illuminating power of gas of such a quality as is usually supplied for public use was also invented at a very early period in the history of gas lighting. This is the fish tail burner, which is made by piercing two holes in a diagonal direction at about right angles to each other in the burner top. The jets of issuing gas impinge upon each other, and produce a broad sheet of flame. This burner still continues in use, and at the present time is more extensively adopted throughout Great Britain than, perhaps, any other, its scientific defects notwithstanding. It is, however, very rarely used on the Continent.

At the outset of gas lighting a rapid deterioration in the manufacture of burners arose in consequence of the manner in which gas was supplied to consumers. Before gas meters were invented gas was supplied by contract at so much per light per quarter, and it was important to gas companies that consumers should not use more gas than they paid for. They therefore got their customers to use burners having very small holes—about one-hundredth part of an inch in diameter—so that the gas issuing from the burner was propelled with extreme velocity into the atmosphere. Thus it could not remain long in contact with the oxygen of the atmosphere to become thoroughly incandescent. It developed a greater amount of heat than it did of light. The difference between the method of burning gas adopted before the introduction of meters and the present method of burning it by means of the best kinds of modern burners is very striking. With the old argand and fish tail burners the gas issued from the small holes at the point of ignition with a velocity of from 60 to 90 miles per hour. With the best known modern burner—Sugg's London argand—the gas issues from the holes with a velocity of only a little over one mile per hour. This forcibly illustrates the necessity for the governing power to which we have before alluded. It is a singular fact that the highest results in illuminating power are attained when the gas issues from the burner with the lowest velocity. This discovery was made by Sugg, in 1858, previously to which, however, several inventions were patented for reducing the velocity of the issuing gas, but these were mainly in connection with fish tail burners, and the inventors do not appear to have realized the fact that they were raising the illuminating power of the gas, or if they did, they did not proclaim it. The reduction of velocity attained in any case, however, was but small, and the most notable of these inventions were those of Brönner and of Dunrich. Both inventors adopt similar means for effecting their purpose, which consist in placing under the burner a small cylindrical chamber, through which the gas passes on its way to the burners, which has a much larger orifice than that through which the gas passes from the little chamber. The lower orifice admits the gas at a high velocity, and it issues at a reduced rate of speed from the burner, the speed varying with the kind of burner employed.

Notwithstanding the efforts of gas engineers and others to substitute economical for wasteful burners, there are a great number of burners in use at the present day which destroy the latent illuminating power of the gas consumed to the extent of from 20 to 50 per cent. In fact, there are burners in the market which are said to be both durable and economical, but which sadly lack the latter quality. For a consumption of five cubic feet of London gas per hour they should give 16 candles' illuminating power, whereas careful experiment has shown that they only give six candles for that quantity. In their report to the Board of Trade, dated January, 1870, the Gas Referees state that the result of an examination of a large number of burners in use was the discovery that in London alone an annual saving of at least £250,000 might be effected by the use of good burners. But the possibility of using gas for lighting purposes by means of the crudest apparatus, combined with the ignorance and apathy of the public, still leads to its wasteful and unscientific abuse. Read by the light of the £250,000 wasted in gas in London alone each year, the indifference of the gas companies, too, can be understood, and they may perhaps be pardoned for not interfering in a matter which, commercially speaking, it should be no business of theirs to see set right. The advent of the electric light, however, has roused them into action, and the immediate results were the examples of improved gas lighting to which we have already referred.

[To be continued.]

Baltimore Gas Consolidation.

The Baltimore *Sun* of the 8th instant, contains the following:

"The details of the terms of consolidation are stated to be as follows: The three present companies will go out of existence on the 30th instant, and the new organization will commence operations July 1st, under the title of the "Consolidated Gas Light Company of Baltimore City. The capital stock will be $6,000,000, apportioned $2,000,000 to the stockholders of each of the three corporations. The issue of bonds will be $3,600,000, 30 years, six per cent., and Wm. F. Burns, Wm. Sinclair, and John W. Hall are to be the trustees, to whom the mortgage to secure the bonds will be issued. The stock is to be proportioned on a basis of one share of the Baltimore for a share of the Consolidated Company; four shares of the People's for one share, and 12½ shares of the Consumer's for one share—the shares of the Consolidated being $100 each.

Of the $3,600,000 of bonds, $1,600,000 are to be divided among the stockholders of the Baltimore of June 30th, and $200,000 among the stockholders of the People's of same date, to equalize the companies in the consolidation by reimbursing the stockholders for surplus not divided among them, but which was invested in real estate, etc. In other words, the investment of earnings heretofore made in extensions, improvements, the acquisition of property, etc., all constituting plant, is to be thus reimbursed to the stockholders. The $1,800,000 bonds remaining are to be used for the retirement of the outstanding bonds of the three present companies, and for no other purpose. The outstanding bonded indebtedness of the Consumers' Mutual is $500,000, the People's and the Baltimore absorbing the remainder of the amount set apart.

"Each of the companies will have a surplus to divide among its stockholders before they merge into the consolidation. The Consumer's Mutual will declare a dividend to-morrow, and, it is stated, will after that time have division of surplus. The People's, as stated, will have three to four dollars to divide per share, part of which is represented in the apportionment of bonds above referred to.

The directors of the new company consist of 12 members—four from each of the old companies."

Casting Gas Pipes Vertically.

The subject of casting gas pipes vertically in 12-feet lengths bids fair to become one of considerable importance in the estimation alike of pipe founders, gas managers, gas companies, etc. It seems that vertically-cast pipes of that length down to four inches in diameter are extensively produced in the United States, whereas in Glasgow, which is the largest seat of the pipe founding industry in the world, it is seldom that such pipes are made of less than 15 inches in diameter.

Two or three Glasgow firms are said to have tried to produce pipes of the kind referred to down to 8 inches in diameter; but owing to the great difficulties connected with their foundry plant, the waste, the trouble with the workmen, etc., the results have been anything but satisfactory, and the attempts to meet the inquiries and demands had to be departed from. On that account a number of orders have been put past the Scotch founders, one of them a Canadian order, quite lately, which was eventually placed in the United States. It is urged that Scotch pipe-founders ought not to stick at a trifle in order to meet successfully this new element in competition, and that they should not hesitate to spend some effort in learning what improvements have been made in pipe-founding in America, so that 12-feet lengths

of piping have become a regular article of trade. Doubtless gas managers would welcome the advent of such pipes in this country, as their use would effect a great amount of economy in jointing, and therefore a large saving in the leakage which has so widely and so frequently to be deplored.—*Journal of Gas Lighting.*

New Patent Gas Kitchener.

Beverly & Wylde, of Leeds, exhibit some four or five specimens of different sizes, of a new patent gas kitchener, which they style the "Leeds," and which received the distinction of three silver medals at the late Nottingham Gas Exhibition. The kitchener is very substantial, and its merits, which are by no means few, are easily put to the test. On the top is a grill, under which are three atmospheric burners, by means of which boiling and broiling are accomplished. The oven is capable of receiving a joint of considerable dimensions, provision being also made for the heating of plates. The main advantage of this kitchener is the great saving of gas, which amounts to 30 or 40 per cent., effected by its use. One of the strongest objections to this class of stove is known to be the great quantity of heat which it generates after being lighted, but this is completely obviated in the present instance by the stove being lined with white-glazed tiles, between which and the outer frame lies an effective non-conducting lining of silicate of cotton. Thus the heat is retained within the stove, and so thoroughly that after being sufficiently heated, an ordinary joint, on being put in, is cooked in about 30 minutes. The unpleasantness arising from the odor of grease drippings is also removed by a tin dish at the bottom, into which they fall, possessing an outlet which conveys the grease beyond the sphere of the gas action.

Correspondence

Gas Making in the West.

Sioux City, May 28th, 1880.

Mr. Editor: In the columns of the American Gas Light Journal, on file in this office for the past four years, which, by-the-way, have been perused with much interest, so many remarks have appeared based on experience from an Eastern point of view, and so little of the experience from the outposts has been ventilated, that a few etchings from a Western point of view may not be uninteresting.

The advent of cheap light from the abundant supply of kerosene oil has stimulated engineers and chemists to produce a cheap gas, and many departures have been made from the old horizontal retort system, and their respective claims have been duly advertised and discussed, pro and con, from time to time in your columns. It would seem that the demand for the manufactured article, and the local supply of the crude material governed this question in an eminent degree.

It is a settled point that certain qualities of coal carbonized in horizontal clay retorts, by a uniform application of certain heats, will produce nearly uniform quantities of 16 candle gas, under certain retort pressure; and by the application of exhausters and other appliances to assist the exit of gas from the retorts the yield is augmented. The illuminating power of the gas can be increased to advantage by the proper use of crude petroleum, naptha or cannel coal.

It is also clearly demonstrated that a good quality of "commercial gas" can be made from wood, enriched to any desired candle power by crude petroleum or naphtha. From four to five gallons of oil, and from 100 to 107 lbs. of good, dry, hard wood will produce 1000 feet of 20 to 22 candle gas—without the use of an exhauster. As the cost of purification and labor is the same as for coal, and, taking into consideration the fact that wood and oil gas does not freeze in winter, by computing the local cost of material, and deducting the price of tar and coke saved by the coal process, parties can judge which of the two is the most desirable method for them to adopt.

The same rule will apply to water gas, as made by the Lowe, Kidder, Tessie du Motay, or Allen-Harris processes. In Sioux City, and other localities in the West, where hard wood is scarce, and both coal and oil have to be transported from the East, the old coal gas works seem to be most desirable. That point being conceded, the question for the manager to solve is how to make the most out of what he has to do with. This is the momentous local question, the discussion of which is the gist of this article.

Enumerating the local difficulties the Western gas manager has to contend with we find—

First, as a rule, that the works were built by speculators who, realizing they were dealing with parties but little posted in the business, gave a poor article for a large price; then the capital stock of the company was made larger than the sale of gas could pay a dividend on, and perhaps the works were bonded, at a high rate of interest, for all that the plant was actually worth.

Second; the freights on the material for producing gas, and the waste by leakage, and slackage of coal in transit.

Third; the price of labor.

Fourth; the comparative lack of knowledge and appreciation of a good article of gas by the consumers. The fact that parties generally have had but little experience in the use of gas accounts for a greater amount of competition from kerosene than in other sections.

To obviate these difficulties the following points present themselves:

Regarding the works; they must be put and kept in as good a condition for effective and economical work as possible, adopting all the paying improvements that the company will allow. As a high price is paid for material, much must be made of residuals. Save as much coke as possible. If there is a ready sale for tar, at a good price, then it will pay to adopt any effective process that will save coke in the furnace and still keep up the heats. There are two coke furnaces made in France, and also in this country, that guarantee to save-thirds of the coke made. Aside from the attention to the settings of retorts and construction of the ordinary furnace, this subject is one that should particularly interest Western gas companies, because they can always find a ready sale for their coke at a fair price. Regarding the second difficulty, freights and waste in transit; of course, the superintendent will see that the coal is shipped direct from the mine, and that it is transported by the quickest route. He will also insist that it shall be well screened, and free from sulphur and iron pyrites (or disulphide of iron), the prevalence of which greatly adds to the slackage of coal when exposed to moisture of any form, by oxidation. Some coals are impregnated with this substance when it is not visible to inspection; but its presence is made known in the purifiers, and while "clinkering" the furnace. On this point it seems like an imposition for dealers getting their supply of coal by slow water transportation, necessitating two or three handlings of the material, to contract with gas companies for yearly supplies—the waste from slackage is often 15 or 20 per cent.

The labor question will be governed by the extent that the country "settles up." The question of the popularity of the gas with parties who have not been familiar with its use is more controllable; the manager first providing and properly supplying a good and pure gas, must so courteously and persistently advertise his wares that the people will not only know when they have a good thing, but will be willing to pay for it.

In conclusion, it is understood that nothing new is enunciated in this article, which is only intended as a brief summing up of the general outlook of the gas question of to-day, confined to a few local points.

F. W. Robinson.

Suffocation by Water Gas.

Mr. Editor: I read with interest your editorial on the above topic in your last issue. Since then, another death of a water gas consumer has happened at the Southern hotel. I have been amazed at the startling number of deaths among water gas consumers. Ten of them suffocated in less than two years in this city is the record, I believe, of the public Press, and this, too, with a comparatively limited distribution, and among the best and most careful class of consumers!

What would be the result if all the lights in a district were extinguished at midnight and the gas immediately put on again, as was the case in several cities on the night of April 16th? Is it a fact that more deaths have occurred in two years in New York city alone, among the water gas consumers, than among the coal gas consumers of the whole country? Why is water gas so poisonous? Is it true that in France the manufacture of water gas has been forbidden, and none has been made there for many years? Will it probably be forbidden here?

If a coal gas company should change to water gas manufacture, would it be liable to a suit for damages for the deaths of its consumers, and would a jury probably bring in a money verdict against a gas company, as well as against the directors and managers, for changing from the manufacture of comparatively harmless coal gas to that of the apparently poisonous and dangerous water gas?

If some of your readers will answer these questions they will oblige

A Subscriber.

A Terrible Calamity.

Piqua, Ohio, May 25th, 1880.

There occurred on the 25th of May, at this place, the dreadful death of three young men, and the blowing to atoms of one of the finest residences in the city, by the explosion of a bbl. of gasoline in the cellar. This gasoline was used for fuel for cooking purposes in one of the Hull Vapor Stove Company's Machines, manufactured at Cleveland, Ohio. The victims were F. W. Amendt, aged 21 years, John and Charles Perdue, aged respectively 17 and 9 years, and a Miss Jones seriously, if not dangerously burnt.

How much longer will city authorities permit such dangerous material to be used and stored to endanger the lives of persons and destruction of thousands of dollars worth of property.

X.

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—G. WARREN DRESSER.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS

NEW YORK—AMERICAN NEWS Co., 39 and 41 Chambers St
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—PRATT & Co., Corner 9th and Arch Streets.
England—C. W. HASTINGS, 22 Buckingham St., London, W. C.
Germany—B. WESTERMANN & Co., of New York

WEDNESDAY, JUNE 16, 1880.

Official Report of Examinations of Gas for two Weeks ending June 5, 1880, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

May 1880.	Time of Day at which Test were made.	New York Gas-Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
		*	*	†	*	*	†
24		25.65	20.18	26.75	22.30	18.90	29.27
25	Between	24.26	20.26	27.08	22.56	19.28	28.24
26	9.30 A.M.	27.61	20.33	25.00	21.82	19.22	28.28
27	and	23.41	20.42	25.98	22.05	19.00	28.92
28	1 P. M.	24.15	20.14	26.26	21.04	18.06	29.08
29		24.52	20.48	26.32	21.59	18.15	29.15
	Average	24.93	20.29	26.23	21.88	18.77	28.82
31							
June 1		23 31	20.44	25.96	21.24	18.43	29.12
2		19.05	20.36	25.62	21.12	17.96	29.13
3		20.38	19.82	25.08	21.73	17.62	28.72
4		21.84	19.95	25.27	21.65	18.51	28.55
5		24.88	19.84	24.54	22.82	17.90	28.49
	Average	21.89	20.08	25.29	21.71	18.08	28.80

* Five foot lava tip with check.
† Bray's slit union, No. 7.

E. G. LOVE, Gas Examiner.

THIS forenoon, as one of the employees of the Automatic Company was filling the lamp in front of the Germania House, North Second street, the naphtha caught fire, and for a few minutes there was a lively blaze enveloping the whole lantern and attracting quite a crowd. On the fire being extinguished the lantern was taken to the repository for repairs.

such accidents are of frequent occurrence.—New Bedford *Standard*, May 25.

Death of John C. Westwood.

DIED.—On Friday, 14th inst., of paralysis, John C. Westwood, Esq., in the 69th year of his age.

An unusually large concourse of citizens attended to pay their last sad tribute of respect to the memory of this estimable gentleman. He was born at Tipton, Staffordshire, England, on the 7th of May, 1812, and followed the avocation of a shipsmith and boiler maker until he was 37 years of age, when, in 1849, he emigrated to this country. In England he was engaged upon several very important and notable works. He built the first steamboat that plied on the Seine, at Paris, and the first that was ever on the Danube; he also was one of the prominent masterworkmen engaged upon the famous Tubular Bridge over the Menai Straits, one of the most wonderful structures of modern times. Soon after his arrival in this country he went to Cincinnati, and became superintendent of the gas works, the operations of which he systematized and greatly improved; under his supervision they were developed into the immense enterprise into which they have now grown. He afterward became superintendent of the gas works at Springfield, Illinois, and also at Peoria, and finally came to Bucyrus, and took charge of the gas works in February, 1875. Previous to his arrival here the gas works had become a nuisance. The gas was of poor quality, with an exceedingly offensive odor, and the consumption of gas at a very low ebb. The people soon realized that some one who knew his business was at last making the gas—and the improvement was as marked as it was desirable. From exposure in the prosecution of his duties here, he contracted illness that undermined his physical strength, and resulted eventually in paralysis; he had three strokes, the last one three days before his death. His estimable wife died on the 2d of June, not quite a year before him.

He was a quiet, conscientious gentleman, of considerable ability, with a fine education, but of such modest and retiring habits that he was comparatively unknown. Everyone recognized him, however, as a quiet, courteous, estimable gentleman, and he has gone to his grave like a shock of ripe corn in its season, leaving an untarnished name, a worthy family of daughters all highly respected, and a large circle of friends, all of whom have many kind remembrances of his courtesy, kindness, and fidelity. —*Bucyrus Journal*, May 21.

Suffocated by Illuminating Gas.

Yesterday morning a strong odor of gas filled the third story corridor of the Southern Hotel, at Broadway and Washington Place. Investigation disclosed that it poured from the open transom of the room occupied by Adam S. Lawson, a clerk employed by Daniel McLeod & Co., merchants in Church street. When the door was broken open Mr. Lawson was discovered dead in his bed. The window was shut, and gas escaped from an open burner.

It is supposed that Mr. Lawson went to bed intoxicated, and either blew out the gas, or, having once turned it off, unconsciously turned it on again. There is no reason to suppose that he committed suicide. He had lived at the hotel for eighteen months. He was 53 years old and leaves no family. *N. Y. Sun*, June 4.

A New Safety-Lamp.

Mr. James M. Douglass, of Edinburgh, has just patented an invention which seems to afford the means of obviating one of the most serious dangers connected with the working of coal mines. It is well known that the protective efficacy of the Davy Lamp has often been rendered of no avail by the recklessness of the miners, who would persist in taking off the wire-gauze top, either to obtain more light to work with, or to indulge in surreptitious smoking. The expedient of locking the lamps has proved ineffectual to prevent such misconduct, as means have been found for picking the simple locks employed for that purpose.

Mr. Douglass, however, has devised an arrangement whereby any attempt to unscrew the top of the lamp must at once extinguish the light. So effectual is the working of the arrangement that the moment the unscrewing begins the lighted portion of the wick commences to sink in its tube; and before the lamp can be opened it has entirely disappeared, having, in fact, been drawn quite down among the oil. The mechanism is simple and does not seem liable to get out of order; and the expense of fitting it upon the ordinary lamp is said to be trifling. The invention is, we understand, in course of being tried in the Blantyre colliery.—*British Mail.*

Remunerative Gas Stock.

Gas company stock in St. Catharines, Ont., seems to be very remunerative to the stockholders. The gross earnings for the year ending March 1, 1880, amount to $27,103.90, and the ordinary expenses $13,614,67, leaving $13,489.23 as the net earnings, out of which two dividends of five per cent. each, amounting to $10,000, were declared and paid. The sum of $19,187.64 remains to the credit of the profit and loss account.—*Engineering News.*

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)

34 PINE STREET, NEW YORK CITY.

JUNE 16, 1880.

☞ All communciations will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

	Capital.	*Par.*	*Bid.*	*Asked.*
Gas Co.'s of N. Y. City.				
Central	466,000	50	60	70
Harlem	1,800,000	50	70	75
" Bonds	170,000			103
Manhattan	4,000,000	50	180	190
Metropolitan	2,500,000	100	138	145x
" Scrip	$1,000,000	...	100	103x
Mutual	5,000,000	100	70	75
" Bonds, gold	900,000	1000	100	—
Municipal	1,500,000	100	150	160
" Bonds	750,000		106	110
New York	4,000,000	100	102	105
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	130x
Citizens	1,200,000	20	67	70
" S. F. Bonds.	320,000	1000	100	105
Fulton Municipal	1,500,000	100	90	80
Peoples	1,000,000	10	35	40
" Bonds	290,000	...	90	95
" Scrip	250,000	...	75	85
Metropolitan	1,000,000	100	65	75
Nassau	1,000,000	25	55	60
" Ctfs.	700,000	1000	85	95
Williamsburgh	1,000,000	50	68	73
" Scrip		...	98	103
Kings Co	135,000	100	60	70
" Bonds	40,000	—	—	—
Union Co. E. N. Y.		25	—	50
Richmond Co., S. I.	300,000	...	75	80
Out of Town Gas Companies.				
Bath, Maine	70,000	100		
Buffalo Mutual, N. Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md.	2,000,000	100	185	190
" Ctfs., gold	1,000,000		—	103

Bayonne, N. J.....		100		90
Brockport, N. Y.....	25,000	100	...	80
Citizens, Newark.....	918,000	50	85	90
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.				190
Derby of Conn.....	160,000	100	60	80
East Boston, Mass...		25	114	120
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind.....		100	...	—
Hannibal, Mo.....	100,000	100	95	100
Hartford, Conn.....	700,000	25	120	125
Hempstead, L. I.....	25,000	100	...	—
Halifax N. S.....	400,000	40	148	150
Hamilton, Ontario...	150.000	40	117½	
Jersey City	750,000	20	155	160
Jamaica, L. I.....	25,000	100	...	—
Jacksonville, Ill.....	120,000	50	100	...
Lewistown Maine...	400,000	100	70	80
Laclede St Louis Mo.	1,200,000	100	93	96
Long Branch..		20	30	40
New Haven, Conn...		25	120	140
Peoples, Jersey City		...	50	60
" " Bds.				5
Peoples of Baltimore		25	100	102
" Bonds....			106	—
Plainfield, N. J.....	80,000	100	—	105
Perth Amboy		25	—	95
Pittsfield, Mass.....			120	130
Rochester, N. Y.....		50	70	80
" Citizens		100	50	60
Rondout & Kingston			75	80
St. Louis Missouri..	600 000	50	300	—
Stillwater, Minn.....	50,000	50	—	26
Saugerties, N. Y....	15,000	100	95	100
San Francisco Gas-Co., S. Fr'isco Cal.			82	83
Toledo, Ohio.....			95	97
Troy, Citizens.....	600,000	100	—	—
Washington, D. C...	1,500,000	20	170	185
" Scrip	500,000	20	100	110
Woonsocket, R. I....	150,000	100	80	...
Wilmington, Del....		50	174	...
Yonkers.....		50	—	70

66 shares Manhattan were sold at auction at 179.

Advertisers Index.

GAS ENGINEERS.

Page.

William Farmer, New York City..... 262
George W. Dresser, New York City..... 285

GAS WORKS APPARATUS AND CONSTRUCTION.

Herring & Floyd, New York City..... 283
T. F. Rowland, Greenpoint, L. I..... 283
Delly & Fowler Philadelphia, Pa..... 283
Kerr Murray, Fort Wayne, Ind..... 283
George Stacey & Co., Cincinnati, Ohio..... 283
Bartlett, Robbins & Co., Baltimore, Md..... 283
Morris, Tasker & Co., Limited, Phila., Pa..... 255
P Munzinger, Phila., Pa 283
Brown & Owen, Phila, Pa.. 283

GAS AND WATER PIPES.

McNeals & Archer, Burlington, N. J..... 282
Gloucester Iron Works, Philadalphia, Pa..... 282
Robt. Campbell & Co., New York City.. 282
James Marshall & Co Pittsburgh, Pa..... 282
R. D Wood & Co., Philadelphia, Pa.. 282
Warren Foundry and Machine Co..... 282
Pancoast & Tarr, 28 Platt Street, New York City..... 282
Mellert Foundry and Machine Co., Reading, Pa..... 282

PIPE CUTTING MACHINES.

A. C. Wood, Syracuse, N. Y. 279

RETORTS AND FIRE BRICK.

J. H. Gautier & Co., Jersey City, N. J..... 280
B. Kreischer & Sons, New York City..... 280
Adam Weber, New York City..... 280
Laciede Fire Brick Works, St. Louis, Mo..... 280
Brooklyn Retort and Fire Brick Works..... 280
Borguer & O'Brien, Phila., Pa..... 280
Gardner Brothers, Pittsburgh, Pa..... 280
Henry Maurer, New York City..... 280

DIETERICH'S REGENERATOR FURNACE.

Chas. F. Dieterich, Baltimore, Md... 286

GAS METERS.

Harris, Griffin & Co., Philadelphia, Pa..... 286
American Meter Co., New York and Philadelphia, Pa.. 287
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa287
Harris, Helme & McIlhenny, Philadelphia, Pa..... 287

GAS STOVES.

The Goodwin Gas Stove and Meter Co., Phila., Pa. ... 264
Retort Gas Stove Co., Providence, R. I..... 288

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y..... 281

EXHAUSTERS.

P. H. & F. M. Roots, Connersville, Ind.. 281
Smith & Sayre Manufacturing Co., New York City..... 281

GAS COALS.

Penn Gas Coal Co., Philadelphia, Pa..... 285
Perkins & Co., New York City.....284 285
Cannelton Coal Co., " " " " 285
New York & Cleveland Gas Coal Co., Pittsburgh, Pa.... 285
Newburgh Orrel Coal Co., Baltimore, Md..... 285
Despard Coal Co., Baltimore, Md..... 285
Tyrconnell Coal Co., Baltimore, Md..... 285
Fort Pitt Gas Coals..... 285
West Fairmont and Marion Coal Co., N. Y. City..... 285
Montauk Gas Coal, New York City. 284

GAS ENGINES.

Schleicher, Schumm & Co., Philadelphia, Pa..... 279

BURNERS.

C. Gefroner, Philadelphia, Pa..... 283

PURIFYING MATERIAL.

Connelly & Co., Pittsburgh, Pa. 283

TAR BURNER, AND BLOWER FOR BURNING BREESE.

H. E. Parson, New York City..... 255

PROCESSES.

Strong Gas-Fuel and Light Co 284
Gwynne Harris, New York City..... 282

GAS FIXTURES.

Mitchell, Vance & Co., New York City..... 281

CEMENT.

S. L. Merchant, New York City..... 281
F. O. Norton, New York City..... 281

BOOKS.

Economy of Gas as a Fuel... 280
Scientific Books..... 284
Cathels, Gas Consumer's Manual..... 287
Fodell's Book-Keeping..... 287
Journal des Usines a Gaz.. 284
Review of Gas and Water Engineering..... 287
Gas Analyst's Manual..... 284

FOR SALE,

GAS-WORKS IN PUTNAM, CT.,

Built in 1878.

Besides the town, there are 8 mills on line of main. Will be sold LOW if taken at once. For further particulars address G. C. WINSOR, P. O. Box 3571, BOSTON, MASS.

SITUATION WANTED

AS MANGER OF SMALL OR FOREMAN OF LARGE GAS WORKS,

By an Experienced Man

Who understands the manufacture and distribution of gas. Has had successful management of gas works in England.

Address MANAGER,
Care Box 273, DENISON, TEXAS.

Engagement Desired

By a Gas Superintendent of Seventeen Years' Experience.

Has had the entire management of a gas works, including distribution, for over 12 years. Satisfactory references.

503-6 Address "B," 31 WEST SIXTH ST., COVINGTON, KY.

Gasholder for Sale.

GUIDE FRAME AND GASHOLDER FRAME.

40,000 Cubic Feet Capacity. All in Good Condition.

Sold because the room is required for other improvements.

JOHN W. NEWELL, Supt.,

503-4 NEW BRUNSWICK, N. J.

PROPOSALS.

THE PRESENT CONTRACT OF LIGHTING THE CITY OF GUAYAQUIL BEING ABOUT TO CONCLUDE IN MARCH, 1881, THE TOWN COUNCIL

SOLICITS OFFERS FOR

Lighting said City with Gas

OR ANY BETTER ARTICLE.

The contractor may calculate on 600 lights as a basis, more or less. The proposals must be addressed to MR. GREGORIO DE YCAZA, President of the Town Council of Guayaquil, Ecuador, and will be received not later than July 31st next.

GUAYAQUIL, March 29, 1880.

PEDRO J. NOBOA, Secretary.

For further particulars, apply to R. and C. DEGENER, 50 Wall Street, New York City. P. O. Box 4279. 501-4t

ENGAGEMENT DESIRED.

A Person of Practical Experience as Superintendent of Gas Works

Desires an engagement where strict attention to the duties confided to him will secure ultimately a fair compensation. References can be given. A good, permanent position is desired, where future salary would depend on success of management. Address, "ENGAGEMENT."

Office GAS LT. JOURNAL

Complete Gas Works

FOR SALE.

The Iron Work for a complete Gas Works, with 8 inch connections, consisting of 4 Purifiers, 8 ft. by 10 ft., with Dry Centre Valve, Multitubular Condenser, Scrubber, Bye-pass Valves, 5 feet Station Meter, and Bench Casting for four benches of 5's. All nearly new, and in good condition.

THE MUTUAL GAS LIGHT CO.,

497 tf ST. JOSEPH, MISSOURI.

THE GLOBE STREET LAMP.

J. G. MINER,
Morrisania, N. Y. City.
SOLE MANUFACTURER OF
Miner's Pat. Street Lamps, with Fixtures for Hanging and Bracket Lamps. Also, Miner's Improved Lamp Posts.

"How to Burn Gas."

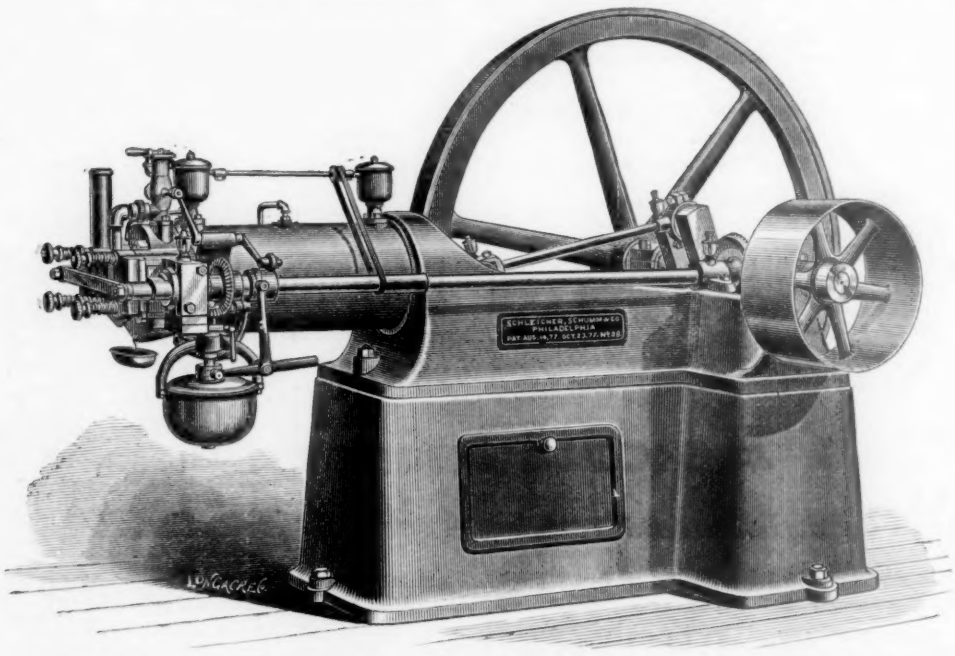
Under this title a neat little book has been issued containing the paper of Mr. Jas. Somerville, as read at the last meeting at Cincinnati, together with a table, taken from Prof. Chandler's lecture, showing the loss of light resulting from the use of shades, etc., of different kinds of glass.

The book is intended for sale to Gas Companies to distribute gratuitously among consumers. If Gas Companies can induce their consumers to use better burners and shades, one-half of the fault-finding will cease.

The price is $10 per thousand. Orders may be sent to the office of this Journal.

SILENT GAS ENGINE.

Always Ready to be Started, and to give at once Full Power.



NO STEAM TO MAKE OR MAINTAIN.

NO COAL, NO ASHES, NO

NO FIRE, NO DANGER, NO EXTRA INSURANCE

NO GAUGES, NO PUMPS NO LEAKAGE

ALMOST NO ATTENDANCE.

BURNS COMMON GAS.

AVERAGE CONSUMPTION PER HORSE POWER,

21 1-2 Cubic Ft. Per Hour.

COSTS NOTHING WHILE STANDING, LITTLE WHILE RUNNING WITHOUT DOING WORK, AND WHILE WORKING THE GAS IS PRECISELY REGULATED BY THE GOVERNOR IN PROPORTION TO THE POWER DEVELOPED

SIZES AT PRESENT OFFERED, **2, 4 and 7 H. P**

LARGER SIZES TO ORDER.

THE NEW OTTO SILENT GAS ENGINE.

Unexcelled for Convenience and Economy in running Gas Exhausters, Tar and Ammonia Pumps, Hoists in Warehouses or Stores, Ventilating Theatres, Halls and Buildings, Driving Electro-Magnetic Machines,

And useful generally for all work of small stationary steam engines. Where work is intermittent, trouble with a steam boiler and engine is at its maximum, but is at its minimum with a gas engine. For particulars, prices, etc., apply to

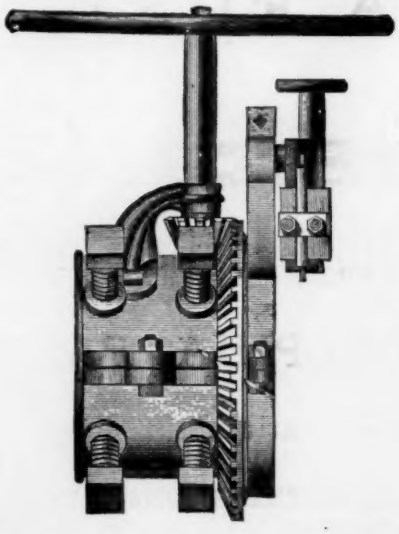
SCHLEICHER, SCHUMM & CO.,
3045 Chestnut Street, Philadelphia.

A. C. WOOD'S
CAST IRON PIPE CUTTER

PATENTED MAY 23rd, 1876.

PRICES REDUCED TO MEET THE TIMES.

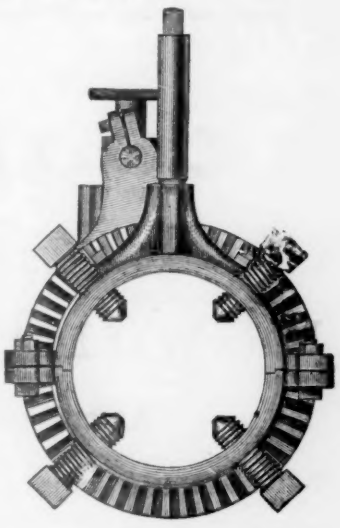
We have been able to reduce the cost of Manufacturing, and desire to give our Customers the benefit at the following



REDUCED RATES:

No. 1 cuts 3, 4 and 6 inch Pipe	*$75*
No. 1 1-2 cuts 4, 6 and 8 in. Pipe,	*$85*
No. 2 cuts 8, 10 and 12 in. Pipe,	*$100*
No. 3 cuts 16, 18 and 20 in. Pipe,	*$225*
NO. 4 cuts 24 and 30 inch Pipe,	*$275*
No. 5 cuts 36 inch Pipe,	*$350*

For larger sizes Special Contracts will be made.



It will cut a Continuous Line of Pipe in a Trench or Building

As well as loose Cast or Wrought Iron Pipe, Shafts or Columns of any size, leaving the ends clean, smooth, and square.

Our Machines for cutting 20 and 30-INCH PIPE have been furnished the Manhattan and New York Gas Light Companies; also for cutting 12, 20, and 30 inch Pipe to the Boston Gas-Light Company. The smaller sized Machines have been in practical use in various parts of the country by Water and Gas Companies, for over two years, and all with the most satisfactory results. Addres

A. C. WOOD, Syracuse, New York.
HERRING & FLOYD, No. 744 Greenwich street, N. Y.
BROWN & OWEN, 20th and Filbert Sts., Philadelphia.
JOHN T. LANGFORD, 55 Kilby Street, Boston, Mass.

J. H. GAUTIER & CO.,
CORNER OF
GREENE AND ESSEX STREETS,
JERSEY CITY, N. J.
MANUFACTURERS OF
Clay Gas Retorts,
Gas House Tiles,
Fire Bricks, Etc. Etc.
Ground Clay, Fire Brick and Fire Sand in Barrels,
J. H. GAUTIER.
C. E. GREGORY
393-1y

BROOKLYN
Clay Retort & Fire Brick Works,
(EDWARD D. WHITE & CO.)
Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.
VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.
Office, 88 Van Dyke St., Brooklyn, N. Y.

LACLEDE
FIRE BRICKS AND
GAS RETORT WORKS
CHELTENHAM, MO.
Hand and Machine made Retorts and Settings, Superior Fire Bricks for Siemans Gas and Glass Furnace. Bricks and Tiles for Whitwell's Hot Blast Ovens, Blast Furnace and Cupola Tiles, Etc.
Fire Bricks and Tiles
of all shapes and sizes.
Glass Pot Clay. Fine Ground Cla ynd Fire Bricks. Sewer Pipe, Etc.
901 Pine Street, St. Louis, Mo.
642—

ESTABLISHED IN 1845.
B. KREISCHER & SONS,
OFFICE FOOT OF HOUSTON ST., E.R., N.Y.
Gas Retorts,
TILES, FIRE BRICK.
AND EVERYTHING IN THE FIRE CLAY LINE.

MANHATTAN
FIRE BRICK & ENAMELLED CLAY
RETORT WORKS.
ADAM WEBER.
CLAY GAS RETORTS
AND RETORT SETTINGS,
FIRE BRICKS, TILES, ETC.,
Office and Works, 15th Street and Avenue C., N. Y.

Borgner & O'Brien,
MANUFACTURERS OF
CLAY GAS RETORTS
AND RETORT SETTINCS,
FIRE BRICKS, TILES, ETC.
23d St., Above Race,
PHILADELPHIA.
TWENTY YEARS' PRACTICAL EXPERIENCE.

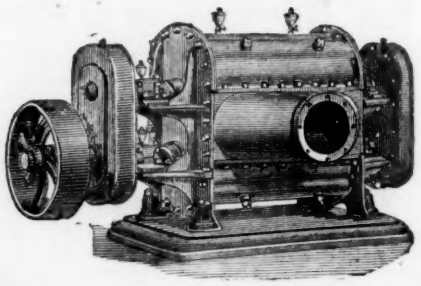
Works, LOCKPORT, PA.
GARDNER BROTHERS,
Works, MT. SAVAGE JUNCTION, MD.
—ESTABLISHED 1864.—
CLAY GAS RETORTS, RETORT SETTINGS, FIRE BRICK, TILES, Etc.
MINERS & SHIPPERS OF FIRE CLAY.
OFFICE, 116 SMITHFIELD ST., PITTSBURGH, PA.
C. H. SPRAGUE, No. 13 EXCHANGE PLACE, BOSTON, MASS., Agent for the New England States.

OFFICE, 418 to 422 East 23d St., New York. ESTABLISHED 1856. WORKS, PERTH AMBOY, NEW JERSEY.
HENRY MAURER,
Excelsior Fire Brick & Clay Retort Works
CLAY GAS RETORTS, BENCH SETTINGS, FIRE BRICK, TILES, ETC.

THE
ECONOMY OF GAS AS A FUEL
FOR
COOKING PURPOSES.

This is a small Pamphlet containing the Paper read by
MR. WILLIAM W GOODWIN, OF PHILADELPHIA, PA.,
At the recent meeting of the American Gas Light Association.
IT IS INTENDED FOR GRATUITOUS DISTRIBUTION BY GAS COMPANIES AMONG THEIR CONSUMERS
Price, Twelve Dollars per Thousand.
ALL ORDERS TO BE SENT TO
A. M. CALLENDER & CO., No. 42 Pine Street, New York.

P. H. & F. M. Roots'



IMPROVED GAS EXHAUSTER

With Engine on same Bed Plate, or without.

BYE-PASSES, GAS VALVES, GOVERNORS, ELBOWS, PIPE-FITTINGS, &C., FURNISHED TO ORDER.

P. H. & F. M. ROOTS, Patentees and Manufacturers, **CONNERSVILLE, IND.**

S. S. TOWNSEND, General Agent, 6 Cortland St. and 8 Dey St., N. Y.
JAS. BEGGS & CO., Selling Agents, 8 Dey St., N. Y.
WM. COOKE, Selling Agent, 6 Cortland St., N. Y.

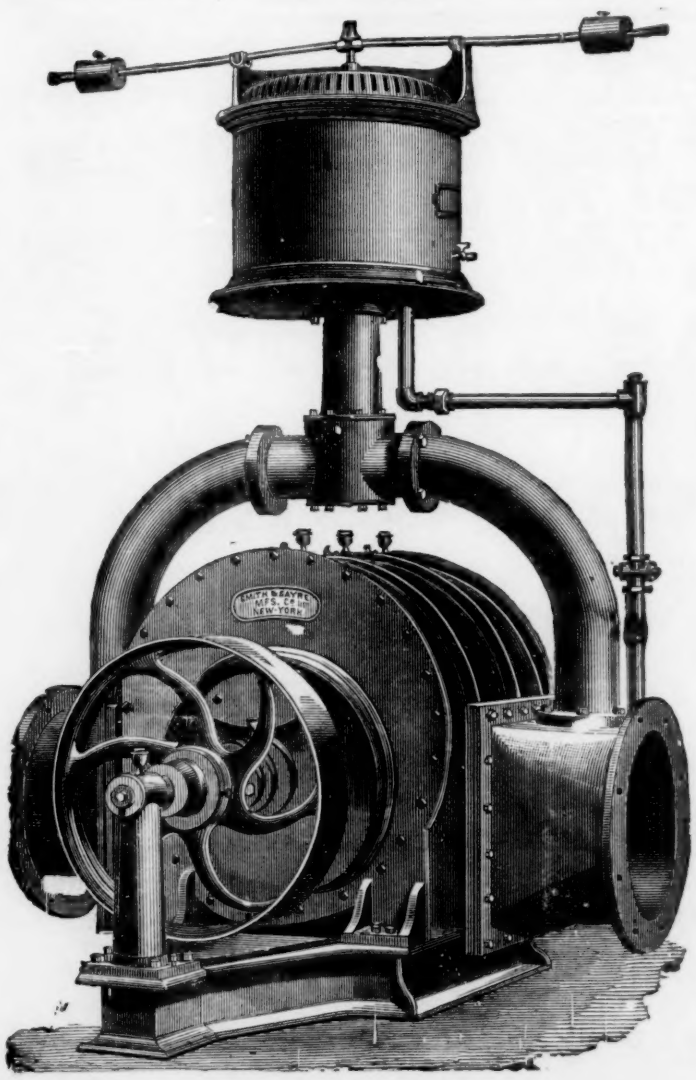
Send for Illustrated Catalogue and Price List.

SMITH & SAYRE MANUFACTURING COMPANY.

Coal and Iron Exchange, 21 Cortlandt Street, N. Y

BUILDERS OF

Machinery and Apparatus for Gas Works.



MACKENZIE'S PATENT ROTARY AND STEAM JET GAS EXHAUSTERS, GOVERNORS, COMPENSATORS, BY-PASSES, CONDENSERS, WASHERS, SCRUBBERS.

ISBELL'S PAT. AUTOMATIC STREET PRESSURE GOVERNOR.

HIGH SERVICE GOVERNOR, GAS AND WATER VALVES, HYDRAULIC MAIN DIP REGULATOR, BENCH CASTINGS, Etc. PURIFYING BOXES, TOWER SCRUBBERS, WITH AUTOMATIC WATER DISTRIBUTOR. *ISBELL'S PATENT SELF-SEALING RETORT DOORS.*

Plans and Estimates for the Improvement, Extension, or Alteration of Gas Works, or for the Construction of New Works.

G. G. PORTER, *President.* CHARLES W. ISBELL, *Secretary.*

MITCHELL, VANCE & CO.

Manufacturers of

CHANDELIERS!

And Every Description of

GAS FIXTURES,

Also Manufacturers of

Fine Gilt Bronze and Marble Clocks, warranted best Time-keepers Mantle Ornaments, &c.

Salesroom, 836 BROADWAY.

NEW YORK.

Special designs furnished for Gas Fixtures for Churches Public Halls, Lodges, &c.

LUDLOW

Valve Manf'g Co.,

OFFICE AND WORKS

938 to 954 River Street and 67 to 83 Vail Ave.

TROY, NEW YORK.

BRASS AND IRON SLIDE VALVES.

(Double and Single Gate ¼ inch to 36 inch—outside and inside screw Indicator etc fo rGas Wate rand Steam—

HYDRAULIC MAIN DIP REGULATORS.

ALSO

FIRE HYDRANTS.

REFERENCES FURNISHED.

SEND FOR CIRCULARS.

Portland Cement,
Roman Cement,
Keene's Cement,
Sellars Gas Cement.

English Fire Brick, No. 1.
" Silica Fire Brick.

IMPORTER

S. L. MERCHANT,

41 Broadway, New York,
Just below Trinity Church. 344-1y

☞ Remit 25 cents postage for "Practica Treatise on Cement.

F. O. NORTON,

MANUFACTURER OF

Hydraulic Cement.

Specially adapted for gas works. Under water it is capable of giving better results than Portland or any other cement.

90 BROADWAY (Cor. Wall St.,) NEW YORK.

Preserve the Journal!

We will furnish to our subscribers an important article for *preserving in a convenient form*, the numbers of the Journal as it is issued at the very low price of $1.25. Sent either by Express or Mail, as directed.

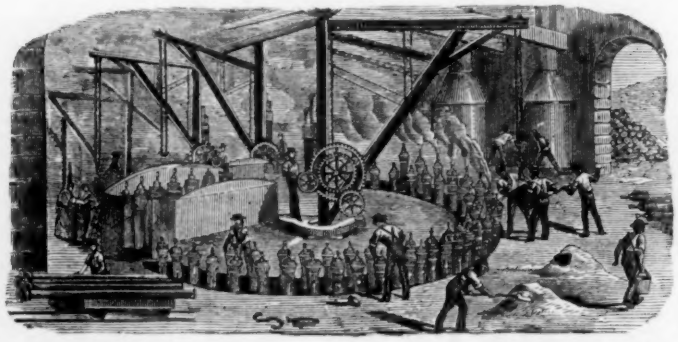
By mail the postage will be 20 cents, which will be added to the price of the Binder. Send orders to

A. M. CALLENDER & CO.
42 Pine Street. Room 18, New York.

M'NEALS & ARCHER,

BURLINGTON. N. J,

Flange-Pipes



General Foundry Work.

CAST IRON PIPES

FOR WATER AND GAS.

DAVID S. BROWN, Pres.
BENJAMIN CHEW, Treas

JAS. P. MICHAELSON, Sec.
WM. SEXTON, Supt.

GLOUCESTER IRON WORKS,

GLOUCESTER CITY, N. J.

CastIron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gas-Holders. &c.

Office No. 6 North Seventh Street, Philadelphia.

ESTABLISHED 1856.

WARREN FOUNDRY AND MACHINE CO.,

WORKS AT PHILLIPSBURGH, N, J.
NEW YORK OFFICE, 153 BROADWAY.

Cast Iron Water and Gas Pipe

FROM TWO TO FORTY-EIGHT INCHES DIAMETER.
ALSO ALL SIZES OF

FLANGE PIPE for Sugar House and Mine Work.

Branches, Bends, Retorts, Etc., Etc. 436-1

CAST IRON PIPE.

WE HAVE ON HAND, IN STORE, FOR IMMEDIATE SHIPMENT,

A Large Quantity of Cast Iron Pipe,

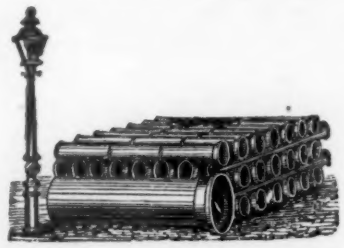
WITH A FULL ASSORTMENT OF SPECIAL CASTINGS.

MOST OF THEM ARE GAS WEIGHTS—PART OF THEM COATED WATER WEIGHTS.

Made by Warren Foundry, Wood, McNeals, and Camden Iron Works,

UNDER CAREFUL INSPECTION, AND ARE OF THE VERY BEST QUALITY.

PANCOAST & TARR, 28 Platt St., New York.



R. D. WOOD & CO.,

PHILADELPHIA.

MANUFACTURERS OF

CAST IRON PIPE

FOR GAS AND WATER

Lamp Posts, Valves, Etc.

Mathew's Pat. Anti-Freezing Hydrants,

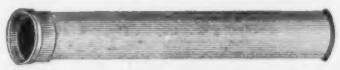
400 Chestnut Street.

JAMES MARSHALL & CO.

Franklin Foundry and Pipe Works,

MANUFACTURERS OF

GAS, WATER, AND OIL PIPES



Works, 18th, 19th, 20th and Railroad Street.
Office, No. 23 Nineteenth Street.

Pittsburgh, Pa.

N.B.—Pipes from 3-inch and upwards cast in 12 ft. lengths.
☞ Send for Circular and Price List.

BERGEN IRON WORKS.

ROBT. CAMPBELL & CO.

MANUFACTURERS OF

CAST IRON PIPES,

FOR WATER AND GAS,

Valves, Fire and Dock Hydrants,
Lamp-Posts and Flange Work,
Bench Castings for Gas Works, &c.

Office, 85 Liberty Street, N. Y.

Mellert Foundry & Machine Co.,

Limited. Established 1848.

MANUFACTURERS OF

CAST IRON GAS & WATER PIPE,

With Special Castings, Flange Pipe, Water Gates, Fire Hydrants, Lamp Posts, etc.

The Improved Canada Turbine Water Wheel. Machinery and Castings of every description for Furnaces, Rolling Mills, Grist and Saw Mills, Mining Pumps, Hoists, etc. Columns, Brackets, Iron Railings, etc., etc.

ARNOLD MELLERT, Supt., READING, PA.

NATIONAL COAL GAS COMPANY.

320 Broadway, N. Y., Rooms 50, 51 & 52.

H. P. ALLEN, President.

The process known as GWYNNE-HARRIS, but from later most essential improvements, more appropriately called the ALLEN-HARRIS, or AMERICAN HYDROCARBON process for making "Water Gas," by the decomposition of superheated steam, in fire-clay retorts, set similarly to those in Coal Gas Works, is an established success. More than One Hundred Million cubic feet of gas have been made under this process, and for *permanency* and *brilliancy*, as well as economy both to the manufacturer and consumer, it is superior to any gas made by the old, or any other method.

Our process is *not intermittent* but continuous. The steam and the oil are admitted into the retorts by gauge cocks, and run for days without change. All the materials required, besides the steam, are 17 lbs. of Anthracite coal and about 3½ gallons of Petroleum or Naphtha, per 1000 feet of brilliant gas.

Rights for sale. Inquire of the President.

Kerr Murray,

PRACTICAL GAS ENGINEER,

AND MANUFACTURER OF

ALL THE LATEST IMPROVED

Gas Apparatus,

MACHINERY,

ETC., ETC.

—WORKS,—

South of Railroad Depot,

FORT WAYNE, IND.

BARTLETT, ROBBINS & CO.,

ARCHITECTURAL IRON WORKS.

MANUFACTURERS OF

GAS HOLDERS, BENCH CASTINGS, MULTITUBULAR WATER AND AIR CONDENSERS, COMMON AND TOWER SCRUBBERS, ROTARY & STEAM JET EXHAUSTERS, WROUGHT IRON ROOF FRAMES.

MANUFACTURERS OF ALL DESCRIPTIONS OF GAS APPARATUS.

WORKS:

Cors. Pratt, Scott, McHenry, Ramsay and Bartlett Streets.

BALTIMORE, MARYLAND.

Plans, Specifications, and Estimates furnished. Correspondence solicited. 467-1y

---

CONNELLY & CO.,

SOLE MANUFACTURERS OF

Iron Sponge Purifying Material

AND

CONNELLY'S JET EXHAUSTERS.

PITTTSBURGH, PA.

C. CEFRORER.

Manufacturer of

GAS BURNERS,

GAS HEATING AND COOKING APPARATUS.

FITTERS' PROVING APPARATUS, ETC.

No. 248 North Eighth Street, Philadelphia.

1842. DEILY & FOWLER 1880.

LAUREL IRON WORKS.

ADDRESS, 39 LAUREL STREET,

PHILADELPHIA.

MANUFACTURERS OF

GAS HOLDERS,

SINGLE AND TELESCOPIC—WITH CAST OR WROUGHT IRON GUIDE FRAMES.

We are prepared to furnish Holders, Wrought Iron Roof Frames, Bench Castings, Condensers, Scrubbers. Purifiers, Drips, Bends, Tees, and all other Iron Work connected with Gas Works. We have built 12 gas works and 122 gasholders. Personal supervision given to the erection of all our work. Holders built at following places since 1868:

Lancaster, Pa. (2)
Williamsport, Pa. (3)
Bristol, Pa. (2)
Catasaqua, Pa.
Kittanning, Pa.
Hazelton, Pa.
Freeport. Pa.
Huntingdon, Pa.
Pittston Pa.
Bethlehem (S). Pa.
Sharon, Pa.
Canton, Pa.
Carlisle, Pa.
Beaver Falls, Pa.
Annapolis, Md. (2)
Parkersburg, W. Va.
Lynchburg, Va.
Stanton, Va.
Youngstown, O
Steubenville, O.
Zanesville, O.
Mansfield, O.
Marion, O.
Bellevaire, O.
Athens. O.
Barnesville, O.
Newark, O.
Columbus, O.
Franklin, Ind.
Indianapolis, Ind.
Jacksonville, Ill.
Joliet, Ill.
Lawrence, Kansas.
Jefferson City, N. O. La. (2)
Algiers, N. O., La.
Kalamazoo, Mich
Buffalo, N. Y. (2)
Ogdensburg, N. Y.
Waverly, N. Y.
Little Falls, N. Y.
Penn Yann, N. Y.
Watkins, N. Y.
Coney Island, N. Y.
Batavia, N. Y.
Gloucester, N. J.
Salem, N. J.
Mount Holly, N. J.
Plainfield, N. J.
Englewood, N. J.
Flemington, N. J. (3)
Dover, Del.
Pittsfield, Mass.
Meriden, Conn.
Milwaukee, Wis.
Burlington, Vt.
Hoosick Falls, N. Y.
Attica, N. Y.

BROWN & OWEN,

MANUFACTURERS OF

EVERY DESCRIPTION OF

Gas and Water Works Supplies.

Particular attention given to the alteration of old works. Estimates and Drawings furnished.

THOS. R. BROWN, **R. PITT OWEN.**
Late Chief-Eng. Phila. Gas Works.

Address all communications to

N. W. Cor. 12th and Noble Streets,

482-1y **PHILADELPHIA.**

HERRING & FLOYD,

Oregon Iron Foundry

738, 740, 742 and 744 Greenwich St., N. Y

MANUFACTURERS OF

ALL KINDS OF CASTINGS
AND
APPARATUS FOR GAS-WORKS.

BENCH CASTINGS
from benches of one to six Retorts each.
WASHERS: MULTITUBLAR AND AIR CONDENSERS CONDENSERS; SCRUBBERS,
(wet and dry), and
EXHAUSTERS
for relieving Retorts from pressure.
BENDS and BRANCHES
of all sizes and description.

FLOYD'S PATENT
MALLEABLE RETORT LID.
BUTLER'S
COKE SCREENING SHOVELS.

SABBATON'S PATENT
FURNACE DOOR AND FRAME.

SELLER'S CEMENT
for stopping leaks in Retorts.
GAS GOVERNORS,
and everything connected with well regulated Gas Works low price, and in complete order.
N. B.—**STOP VALVES** from three to thirty inches—at very low prices.
SILAS C. HERRING. JAMES R. FLOYD

GEO. STACEY. HENRY BANSHAW. WM. STACEY

GEO. STACEY & CO.

MANUFACTURERS OF SINGLE AND TELESCOPIC

GAS-HOLDERS

AND ALL KINDS OF

Cast and Wrought Iron Work

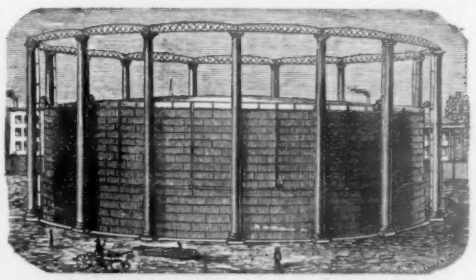
Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39
Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

Cincinnati Gas-Light Co.
Indianapolis Gas Co.
Dayton, O., Gaslight Co.
Covington, Ky., Gas Co.
Springfield, O., Gas Co.
Terre Haute, Ind., Gas Co.
Madison, Ind., Gas Co.
Kansas City, Mo., Gas Co.
Topeka, Kansas, Gas Co.
Burlington, Iowa, Gas Co.
Nashville, Tenn., Gas Co.
Baton Rouge, La., Gas Co.
Saginaw, Mich., Gas Co.
Oshkosh, Wis., Gas Co.
Peoria, Ill., Gas Co.
Quincy, Ill., Gas Co.
Champaign, Ills., Gas Co.
Carlinville, Ill., Gas Co.
Bowling Green, Ky., Gas Co.
Hamilton, Ohio, Gas Co.
Vicksburg, Miss., Gas Co
Denver City, Col., Gas Co.
R. T. Coverdale, Eng'r Cincinnati, and others.

CONTINENTAL WORKS.



GASHOLDERS OF ANY MAGNITUDE.

T. F. ROWLAND, Proprietor,

GREENPOINT, BROOKLYN, N. Y

ENGINEER AND MANUFACTURER OF

GAS-HOLDERS,

CONDENSERS, SCRUBBERS, VALVES, PURIFIERS, RETORTS, and HYDRAULIC MAINS,

and all other articles connected with the Manufacture and Distribution of Gas. Plans and Specifications prepared and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

P. MUNZINGER,

Engineer and Builder,

No. 1211 MARKET STREET, PHILADELPHIA, PENN.

BUILDER AND CONSTRUCTOR OF ALL KINDS OF GAS MACHINERY,

ON THE LATEST AND MOST IMPROVED PLAN.

Bench Castings, Condensers, Scrubbers, Purifiers, Centre Valves, Gasholders, Stop Valves, Etc., Etc.

Estimates and Drawings Furnished upon Application.

NEWCASTLE AND PROVINCIAL GAS COALS.

THE UNDERSIGNED ARE PREPARED TO EXECUTE ORDERS FOR

NEWCASTLE COAL (TOWNLEY),

ALSO FOR THE BEST QUALITIES OF

PROVINCIAL GAS COAL.

DELIVERED AT ANY PORT IN THE UNITED STATES.

We supplied nearly 100,000 tons of Provincial Coal to some twenty-five different Gas Companies in 1877. These coals will yield in practical use fully

10,000 Cubic Feet of 16 1-2 Candle Gas---40 Bushels Coke.

JAMES D. PERKINS.
F. SEAVERNS.

PERKINS & CO

41 SOUTH STREET, NEW YORK.

THE MONTAUK GAS COAL COMPANY

JOHN WHITE, President,

Trinity Building, No. 111 Broadway, New York.

WHARVES, LOCUST POINT, BALTIMORE, MD.

JAMES BOYCE, Agent and Shipper, BALTIMORE.

JOURNAL des USINES a GAZ.

Issued on the 5th of each Month.

THIS JOURNAL CONTAINS ALL THE LATEST SCIENTIFIC AND PRACTICAL INFORMATION RELATING TO GAS MANUFACTURE IN FRANCE.

MESSRS. SERVIER, MONNIER, AND ROUGET, EDITORS AND MANAGERS.

Subscriptions Received at this Office. **Price, Post-paid, $3.50 Per Annum.**

THE GAS ANALYST'S MANUAL.

BY F. W. HARTLEY, A.I.C.E., M.S.E. **E. & F. N. SPON, PUBLISHERS.**

PRICE, $2.50.

CONTENTS. SECTION I.—The purposes of photometry. Standard light. Standard burner. Gas Works Clauses Act Amendment Act, 1871:—Regulations in respect of testing apparatus, mode of testing for illuminating power, and for sulphuretted hydrogen. Description of standard apparatus. The photometer room. Preparation of candles. Testing operations. Readings. Correction for gas consumpt. Corrections for candles' consumpt. Corrections for barometric pressure and temperature. Ordinary photometers. The inferential or jet photometers. To set the jet photometer at work. To rate the jet photometer.

SECTION II.—Duration and mode of testing in London, sulphuretted hydrogen, ammonia, sulphur compounds. Preparation of solutions. Fitting up. To set the apparatus at work. Analysis.

SECTION III.—Ammonia. Sulphuretted hydrogen. Carbonic acid. The Cooper's Tube, or Eudiometer. To calculate weight of sulphur. Harcourt's color test. A rapid and accurate methodof estimating sulphur in coal gas. Specific gravity. To find the specific gravity of dry gas. To correct the bulk and find the weight of gas.

APPENDIX.—Rules and tables to facilitate the calculations necessary in the determination of the illuminating value and degree of purity of coal gas. Photometry. Ammonia and sulphur. Proving of testing meters in London. The gas referees' cubic-foot measure. Times and mode of testing for pressure in London. Proposed standards of light.

A. M. Callender & Co., 42 Pine Street. N. Y.

KING'S TREATISE

ON

COAL GAS.

Vol. I., Bound in Cloth, $10.

A. M. CALLENDER & CO., 42 Pine Street, N. Y.

THE ECONOMY

OF

GAS AS A FUEL

FOR

Cooking Purposes.

Price, $12 a Thousand.

SCIENTIFIC BOOKS.

We are prepared to furnish to GAS MANAGERS and others interested in the topics treated of, the following Books, at prices named:

GAS MANUFACTURE, by WILLIAM RICHARDS. 4 to, with numerous Engravings and Plates, in Cloth binding. $12.

THE GAS ANALYST'S MANUAL, by F. W. HARTLEY. $2.50.

ANALYSIS, TECHNICAL VALUATION, PURIFICATION and USE OF COAL GAS, by Rev. W. R. BOWDITCH, M. A., with Engravings. 8 vo Cloth. $4.50.

NEWBIGGINS HAND BOOK, by THOMAS NEWBIGGIN, C. E. $3.75

GAS CONSUMERS HAND BOOK, by WM. RICHARDS. C. E. 18 mo. Sewed. 20 Cents.

GAS CONSUMERS MANUAL, by E. S. CATHELS, C.E. 10 Cents.

PRACTICAL TREATISE ON HEAT, by THOMAS BOX. Second edition. $5.

AIR AS FUEL, OR PETROLEUM AND OTHER MINERAL OILS UTILIZED BY CARBURETTING AIR, by OWEN C. D. ROSS, Member Institute Civil Engineers. 8 vo. Cloth. $1.50.

The above will be forwarded by Express. upon receipt of price.

We will take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances must be made by Check, Draft, or Post Office Money Order.

A. M. CALLENDER & CO.,
Room 18, No. 42, Pine Street, N. Y.

WATER GAS.

Strong Gas-Fuel and Light Co.,

No. 120 Broadway

(EQUITABLE BUILDING), NEW YORK.

This Company is the Sole Proprietor for the State of New York of the Strong and Lowe Processes for the Manufacture of Water Gas.

Works are now being constructed according to the Strong patents at Yonkers, to supply that city with gas for

Light, Heat, and Power.

One pair of generators, the cost of which will not exceed $18,000, will make about 400,000 cubic feet per day.

The Lowe system is already in successful operation for lighting in more than thirty places in the United States, and in many of our large cities.

The rapid progress that water gas is making in the public favor, and the great economy and efficiency of the Strong and Lowe processes over all others for its manufacture, should secure for these processes a careful examination on the part of all gas companies now existing or about to be formed.

N. B.—For licenses or further information, appply at the office of this company, as above.

Dated March 8, 1880.

THE AMERICAN GAS-LIGHT JOURNAL.

$3 PER ANNUM.

42 Pine Street, N. Y.

NEW YORK AND CLEVELAND

GAS COAL COM'Y

Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

YOUGHIOGHENY GAS COAL.

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation. on most favor able terms.

General Office—89 Wood Street,
PITTSBURGH, PA.

Branch Office—120 Water Street,
CLEVELAND, OHIO.

WILLIAM A. McINTOSH, President.
A. CARNEGIE, Vice-President.
W. P. DE ARMIT, Treasurer.
THOMAS AXWORTHY. Agent
at Cleveland, Ohio.

351-1y

THE NEWBURGH

Orrel Coal Company,

Mines at Newburg, Preston County, W. Va.
Company's Office, No. 52 S. Gay Street, Baltimore, Md.
C. OLIVER O'DONNELL, Pres't. CHAS. MACKALL, Sec'y.
CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

Ithas been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to he Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizen's Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and the Providence Gas Light Company, Providence, R. I.

Best dry coals shipped from Locust Point, wharves, and prompt attention given to orders for chartering of vessels.

224-1y n

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.

Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
Company's Office, 15 German St., }

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine

*** Reference to them is requested. 204-1

TYRCONNELL GAS COAL.,

MINED IN TAYLOR COUNTY, WEST VA.

Company's Office, 52 S. Gay St., Baltimore.

CHARLES MACKALL, Secretary.

CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.

SHIPPING POINT—Baltimore, Md.

This coal yields 10,000 cubic feet of Gas with an illuminating power of over 16 candles. Forty bushels of very superio oke, with little Ash and scarcely any clinker 04-1y

GEO. W. DRESSER,

CIVIL ENGINEER.

TRINITY BUILDING

ROOM 89. 111 BROADWAY.

GAS COALS.

THE

PENN GAS COAL COMPANY

OFFER THEIR

COAL, CAREFULLY SCREENED,

AND PREPARED FOR

GAS PURPOSES.

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station on the Pennsylvania Railroad, and on the Youghiogheny River.

OFFICES

No. 209 South Third Street, Phil'a. 90 Wall Street, New York.

PLACES OF SHIPMENT.

Pennsylvania Railroad, Pier No. 2 (Lower Side).
Greenwich Wharves, Delaware River.
366-1y **Pier No. 1 (Lower Side), South Amboy, N. J.**

CANNELTON COAL COMPANY

Miners of the celebrated **CANNELTON CANNEL,** acknowledged to be the *best enricher* produced in this country, yielding 10,000 cubic feet of 64.54 candle gas per ton of 2,240 pounds.

J. TATNALL LEA, Treasurer, P. O. Box 1747 Philadelphia.

SALES AGENTS: **PERKINS & CO.,** New York. **DANIEL W. JOB & CO.,** Boston. **MAYER, CARROLL & CO.,** Baltimoe

The West Fairmont and Marion Consolidated Coal Company,

Mines at Fairmont, West Virginia,

OFFER FOR SALE THEIR

VERY SUPERIOR GAS COAL,

IN ANY QUANTITY DESIRED, on the shortest notice, at their office, 231 BROADWAY, New York

FORT PITT GAS COAL

THE FORT PITT COAL CO.

OFFER THEIR CELEBRATED

Fort Pitt Gas Coal,

Carefully Screened and Prepared for Gas Purposes, Delivered at any Point reached by Railroad or Navigation, on the Most Favorable Terms.

Office, No. 337 Liberty Street,

PITTSBURGH, PENN.

Box 314. J. E. McCRICKART, Manager.

"SCOTT'S" OCEAN MINE

Youghiogheny Gas Coal.

The undersigned, agents for the above well-known Gas Coal, are prepared to contract for its delivery at any point in New York and New England. Shipments made immediately if desired

PERKINS & CO.,

41 SOUTH STREET, NEW YORK. Box 3695.

INTERNATIONAL--1876--EXHIBITION.

The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

HARRIS, GRIFFIN & CO.,

12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S, A.,

FOR THE FOLLOWING REASONS:

The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which with the general character of the Exhibit, entitle the whole to commendation.

Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President.

GROUP JUDGES.

AMERICAN.

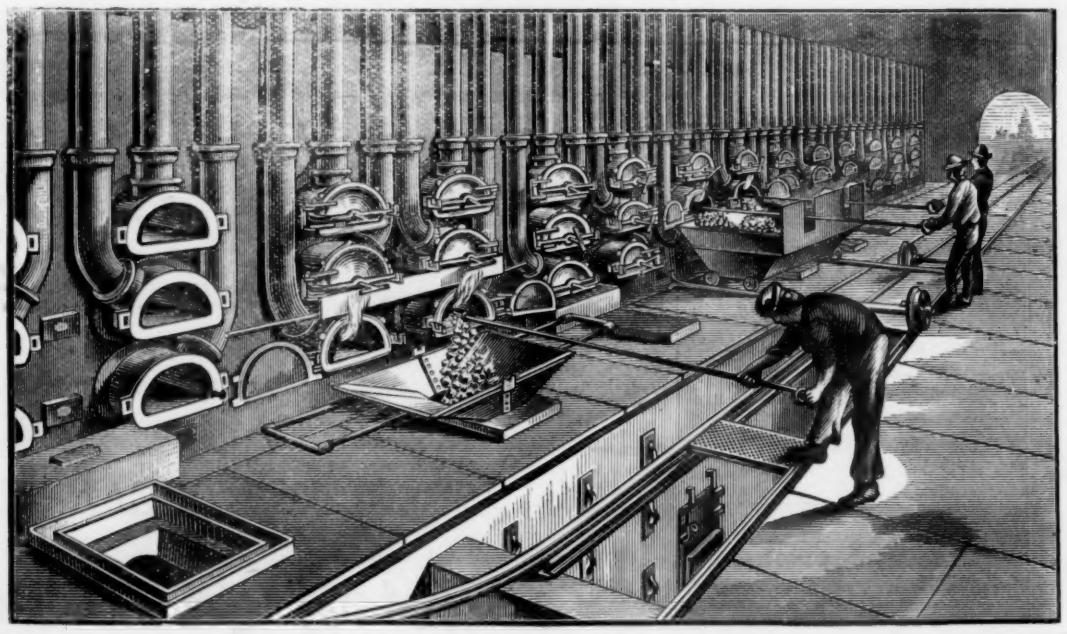
PROF. JOSEPH HENRY, LL.D., Secretary of Smithsonian Institution, Washington, D. C.
PROF. F. A. P. BARNARD, S.T.D., LL.D., President of Columbia College, N. Y.
PROF. J. E. HILGARD, Washington, D. C.
PROF. J. C. WATSON, Ann Arbor, Michigan.
GENERAL HENRY K. OLIVER, Salem, Massachusetts.
GEORGE F. BRISTOW, New York.

FOREIGN.

SIR WILLIAM THOMSON, LL.D., D.C.L., F.R.S., Great Britain
JUL. SCHIEDMAYER, Germany.
MR. E. LEVASSEUR, France.
P. F. KUPKA, Austria.
EDW. FAVRE PERRET, Switzerland.

Chas. F. Dieterich's Regenerator Furnace.

CAN BE ADAPTED TO ANY BENCH WITHOUT DISTURBING THE ORDINARY SETTINGS.



These Furnaces have been in operation at the works of the People's Gas Company, Baltimore, since June, 1878. A bench of 6's, with retorts 20in.x12in.x8ft. 6in., will burn off 1,350 pounds of coal in 3 hours. Twenty-five per cent. of the coke is sufficient to thoroughly burn off the charges.

State, city, and factory rights granted on reasonable terms. For full particulars apply to either

CHAS. F. DIETERICH, Eng'r People's Gas Co., BALTIMORE, MD.

WM. FARMER, 111 Broadway, N. Y., F. L. HAGADORN, 162 Beach St. Chicago, Ill., or HENRY J. DAVISON, 231 Broadway, N. Y.

T. C. HOPPER, Prest. and Gen. Supt. WM. H. HOPPER, Vice-Prest. WM. N. MILSTED, Treas. WM. H. DOWN, Sec.

AMERICAN METER COMPANY,

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTRE VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR AND JET PHOTOMETERS.

Manufactories:
512 W. 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES—AMERICAN, FRENCH, & ENGLISH.
SUGG'S ILLUMINATING POWER METER.
SUGG'S "STANDARD" ARGAND BURNERS. ALSO NN AND TTT.
Wet Meters, with Lizar's "Invariable Measuring" Drum.
SOLE AGENTS FOR THE ALLEN EXHAUSTER GOVERNOR.

Agencies:
37 Water Street, Cincinnati.
20 South Canal Street, Chicago.
810 North Second Street, St. Louis.
122 & 124 Sutter St., San Francisco.

HELME & McILHENNY,

Successors to Harris & Brother.

ESTABLISHED 1848.

PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 33 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

WILLIAM HELME. JOHN McILHENNY.

WM. WALLACE GOODWIN, Prest. and Treas. WM. H. MERRICK, V.-Prest. H. DUMONT WAGNER, Supt. S. L. JONES, Sec. S. V. MERRICK, Asst. Sec.

THE GOODWIN GAS STOVE AND METER COMPANY,

Successors to W. W. GOODWIN & CO.

No. 1012, 1014 and 1016 Filbert Street, Philadelphia, Pa.

No, 142 Chambers Street, New York

MANUFACTURERS OF GAS STOVES FOR COOKING AND HEATING PURPOSES.

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Goodwin's Improved Lowe's Jet Photometer.

Special attention to repairs of Meters, and all apparatus connected with the business.
All work guaranteed first class in every particular, and orders filled promptly.

Review of Gas and Water Engineering.

ISSUED EVERY ALTERNATE FRIDAY.

Edited and Published by CHAS. W. HASTINGS, 8 Buckingham St., London, Eng.

Each number contains articles in connection with the manufacture and supply of Gas; summary of latest intelligence on the subject of Electric Lighting; articles upon Water Supply; also on the Construction and Maintenance of Gas, Water, and Sewage Works.

Price, 10s., Postpaid.

The Gas and Water Companies' Directory.

Edited and Published Annually by CHARLES W. HASTINGS.

This Work gives a complete list of all Gas and Water Companies throughout England, Scotland, Ireland and Wales; date of formation, amount of capita and names of all officers, etc.; including carbon returns, prices paid for gas, dividends, etc.

Price, in Cloth Covers, 5s.; Paper Covers, 3s. 6d. Postage Extra.

Address, 8 BUCKINGHAM STREET,
LONDON, W. C., ENGLAND.

Orders Received at this Office.

NOW READY AND FOR SALE,

FODELL'S
System of Bookkeeping
FOR GAS COMPANIES.

Price $5, which should be sent either in Check, P. O. Order or Registered Letter.

Blank Books, with printed headings and forms on this system, will be supplied to Gas Companies, by applying to W. P. FODELL Philadelphia, or

A. M. CALLENDER & CO
OFFICE GAS LIGHT JOURNAL, 42 Pine St., N. Y

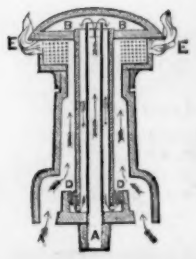
CATHEL'S
GAS CONSUMERS MANUAL.

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.
42 Pine Street, New York, Room 18.

The Celebrated Retort Gas Cooking Stoves



The annexed cut shows the principle of the Retort Gas Stoves. *The gas is superheated before its union with the air*, by passing the same through inner tube A, into retort B. It then descends to chamber C, passes through argand burner D, where it unites with the air. By this process the gas is expanded three times in quantity, thus exposing three times the surface for the air to strike, whereby a much larger amount of air is made to unite with the same amount of gas than with any other gas stove.

ACKNOWLEDGED

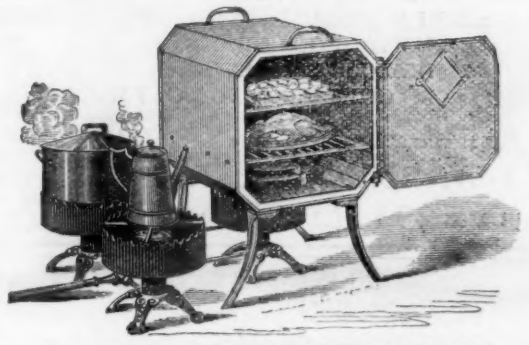
BY ALL SCIENTIFIC MEN

IN THE

United States, Great Britain, France, and Germany

TO BE

THE BEST.



No. 3 Retort Cook and No. 1 Portable Oven.

They do not light back when turned down low. They do not smoke nor smut your dishes. No smell of unconsumed gas.

CAST IRON FRONTS, NICKEL-PLATED TRIMMINGS. ALL SIZES AND PRICES.

THESE STOVES BAKE AND ROAST BY DIRECT HEAT, AND GRILL BY DEFLECTED HEAT.

THEY DO THE ENTIRE FAMILY COOKING, AND GIVE UNIVERSAL SATISFACTION.

No. 8. Retort Gas Cooking Stove.

An Economy over other Gas Stoves of 25 per cent. actually Guaranteed.

RETORT GAS STOVE COMPANY,

OFFICE & MANUFACTORY, 210, 212, & 214 EDDY ST.,

Providence, Rhode Island, U. S. A.

FRED. I. MARCY, President. **H. N. SMITH, Treasurer.**

VOLUME

TIGHTLY BOUND

BEST COPY

AVAILABLE